

Tuberculosis Epidemiology: A Global, National and Virginia Update

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Overview

Global Tuberculosis (TB) Update

National TB Update*

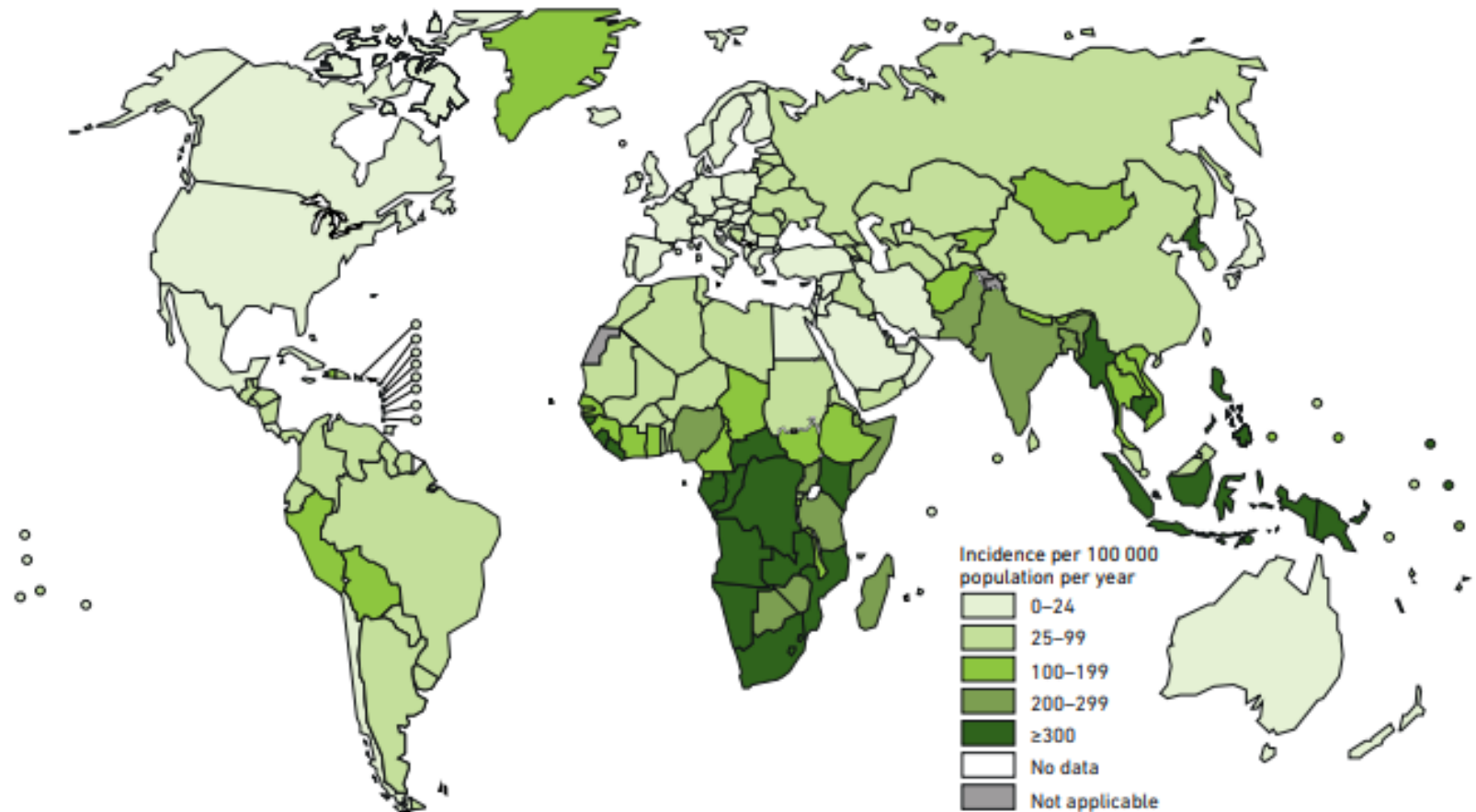
State TB Update*

**Please note that all 2018 data is provisional*

Global Tuberculosis Incidence

- In 2017, an estimated 10 million people fell ill with TB, and 16% of those people died from the disease.
- TB is one of the top 10 causes of death worldwide
- Eight countries accounted for 67% of the new cases: India, China, Indonesia, the Philippines, Pakistan, Nigeria, Bangladesh and South Africa.
- Disease burden caused by TB is falling globally, but not fast enough to reach the first (2020) milestones of the End TB Strategy.
- Nearly one in ever four people in the world is infected with latent TB.

Estimated TB incidence rates, 2017



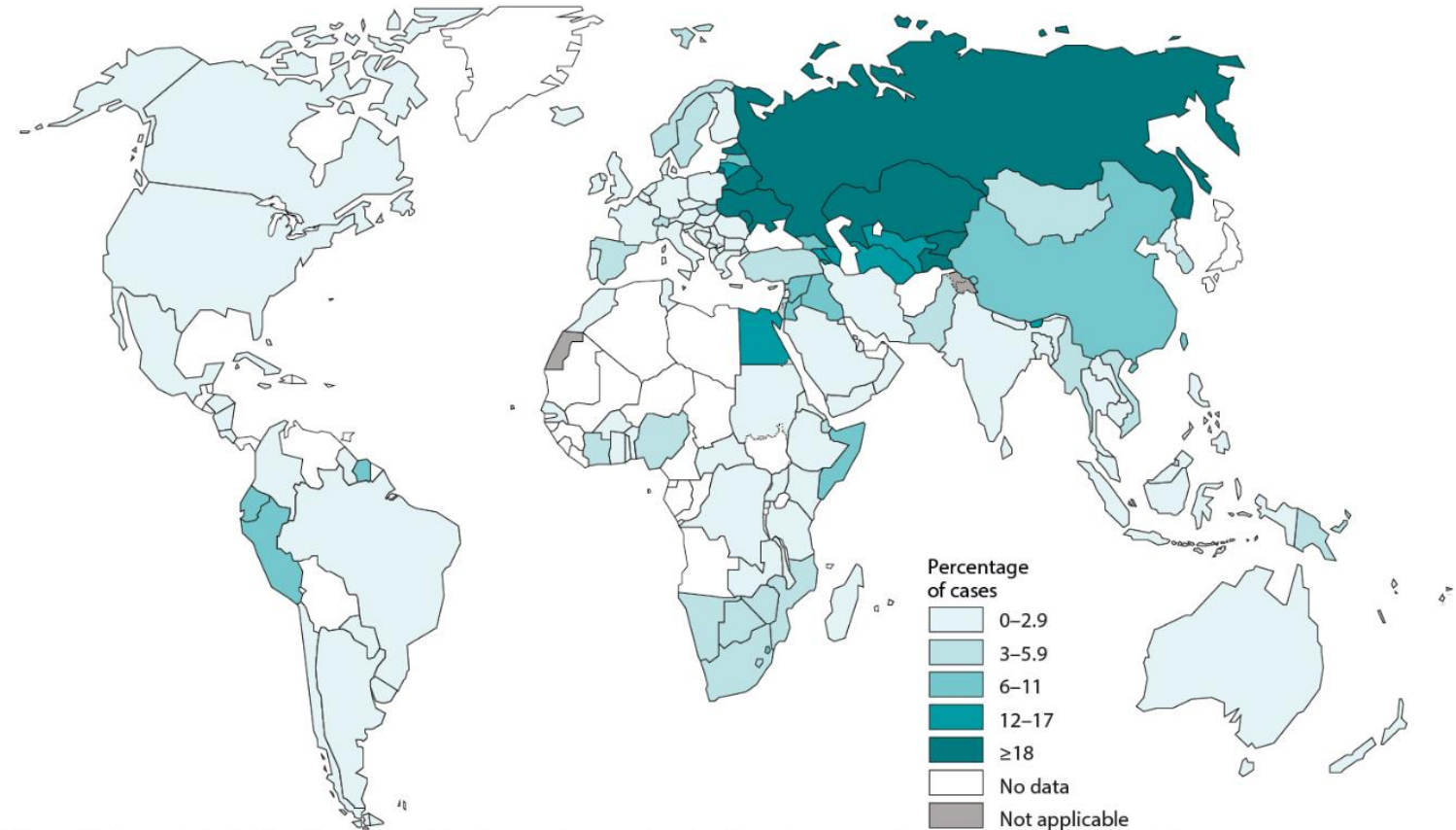
THE END TB STRATEGY

VISION	A world free of tuberculosis – zero deaths, disease and suffering due to tuberculosis			
GOAL	End the global tuberculosis epidemic			
INDICATORS	MILESTONES		TARGETS	
	2020	2025	SDG 2030	END TB 2035
Reduction in number of TB deaths compared with 2015 (%)	35%	75%	90%	95%
Reduction in TB incidence rate compared with 2015 (%)	20% (<85/100 000)	50% (<55/100 000)	80% (<20/100 000)	90% (<10/100 000)
TB-affected families facing catastrophic costs due to TB (%)	Zero	Zero	Zero	Zero

Global MDR/RR-Tuberculosis

- There were an estimated 558,000 incident cases of MDR/RR-TB in 2017, with cases of MDR-TB accounting for 82%.
- The countries with the largest numbers of MDR/RR-TB were China, India and the Russian Federation.
- There were about 230,000 deaths from MDR/RR-TB in 2017.

Percentage of new TB cases with MDR/RR-TB*



* MDR = multidrug-resistant ; RR= rifampicin-resistant
MDR/RR-TB = RR-TB cases including MDR-TB cases

Figures are based on the most recent year for which data have been reported, which varies among countries. Data cover the period 2002–2018.

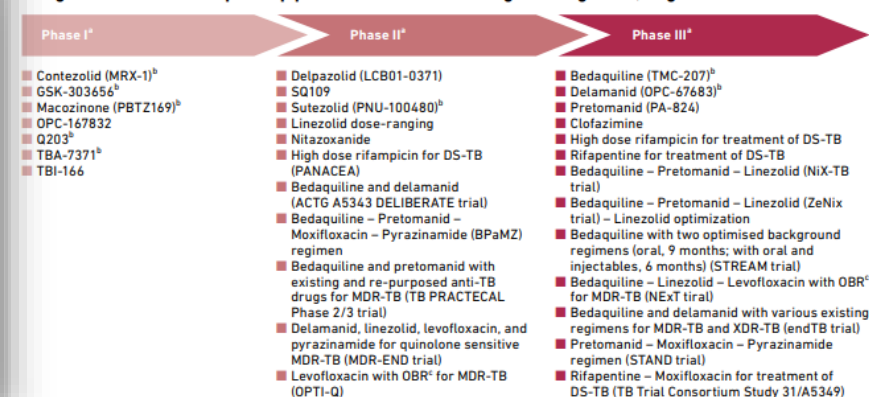
Vaccine and Drug Research

- Vaccines to lower the risk of TB infection
- A vaccine or new drug treatment to cut the risk of TB disease in the 1.7 billion people with infection
- Rapid diagnostics that can be used at point of care
- Simpler, shorter drug regimens for treating TB disease

An overview of progress in the development of TB diagnostics, August 2018^a

TECHNOLOGIES IN DEVELOPMENT	TECHNOLOGIES ENDORSED BY WHO	SCHEDULED FOR WHO EVALUATION IN 2018/19
Molecular detection of TB and drug resistance <ul style="list-style-type: none"> ■ Gendrive MTB/RIF ID, Epistem, UK ■ Xpert XDR-TB cartridge, Cepheid, USA ■ TruArray MDR-TB, Akkoni, USA ■ INFINITIMTB Assay, AutoGenomics, USA ■ FluoroType XDR-TB assay, Hain Lifescience, Germany ■ MeltPro TB assay, Zeesan Biotech, China ■ QuantuMDx, POC, UK 	Molecular detection of TB and drug resistance <ul style="list-style-type: none"> ■ Line probe assays for the detection of <i>Mycobacterium tuberculosis</i> (MTB), isoniazid and rifampicin resistance in acid-fast bacilli smear positive sputum or MTB cultures (FL-LPA), Hain Lifescience, Germany and Nipro, Japan ■ Line probe assays for the detection of resistance to fluoroquinolones and second-line injectable agents (SL-LPA), Hain Lifescience, Germany ■ TB LAMP for detection of TB, Eiken, Japan 	Molecular detection of TB and drug resistance <ul style="list-style-type: none"> ■ Molecular technologies for genotypic drug resistance testing (including sequencing technologies) ■ FluoroType MTBDR, Hain Lifescience, Germany ■ m2000 RealTime MTB System, Abbott, USA ■ BD Max MDR-TB, Becton Dickinson, USA ■ Roche cobas® MTB system, Roche Diagnostics, Basel, Switzerland
Tests for latent TB infection <ul style="list-style-type: none"> ■ Diaskin test, Generium, Russian Federation ■ C-Tb test, Serum Institute of India, India 	Nonmolecular technologies <ul style="list-style-type: none"> ■ Interferon gamma release assay (IGRAs) for the diagnosis of latent TB infection (LTBI) Oxford Immunotec, UK, Qiagen, USA 	Radiology <ul style="list-style-type: none"> ■ Computer aided detection (CAD)
ON THE MARKET (EVIDENCE FOR USE NOT SUBMITTED TO WHO FOR EVALUATION)	Culture-based technologies <ul style="list-style-type: none"> ■ Commercial liquid culture systems and rapid speciation ■ Culture-based phenotypic DST using 1% critical proportion in LJ,7H10,7H11 and MGIT media. 	WHO POLICY UPDATES SCHEDULED FOR 2018/2019
Molecular detection of TB and drug resistance <ul style="list-style-type: none"> ■ iCubate System, iCubate, USA ■ Genechip, TB drug resistance array, Capital Bio, China ■ EasyNAT TB Diagnostic kit, Ustar Biotechnologies, China ■ Truelab/Truenat MTB, Molbio/bigtec Diagnostics, India 	Microscopy <ul style="list-style-type: none"> ■ Light and light-emitting diode microscopy (diagnosis and treatment monitoring) 	Molecular detection of TB and drug resistance <ul style="list-style-type: none"> ■ Alere Determine TB-LAM, Alere, USA (TB detection in people seriously ill with HIV) ■ Xpert MTB/RIF Ultra for detection of TB and rifampicin resistance in pulmonary, extrapulmonary and paediatric samples, Cepheid, USA
Culture-based drug susceptibility testing <ul style="list-style-type: none"> ■ Sensititre™ MYCOTBI plate; ThermoFisher Scientific Inc., USA 		

The global clinical development pipeline for new anti-TB drugs and regimens, August 2018



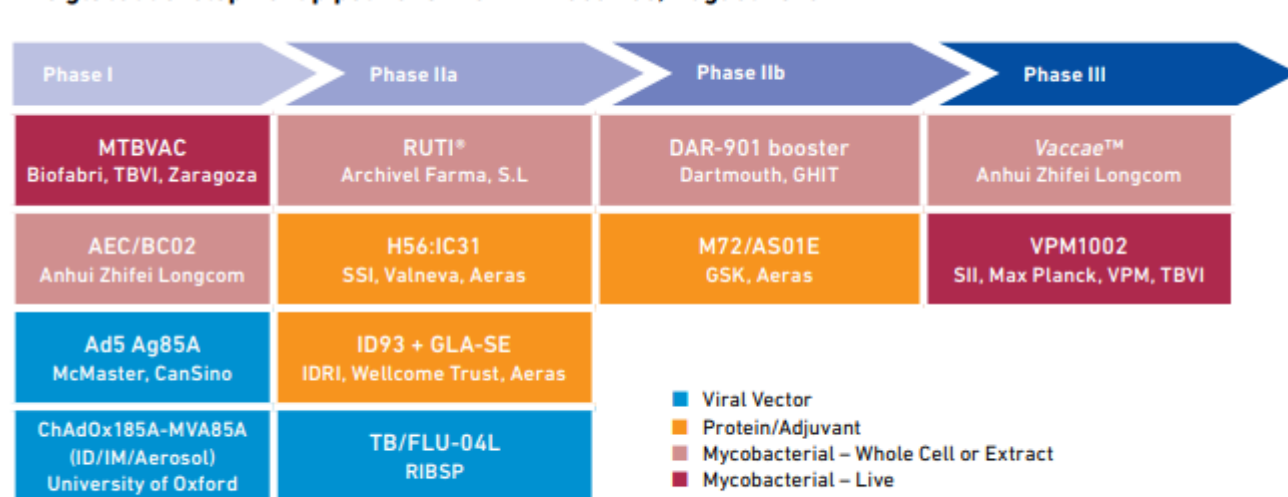
^a New drug compounds are listed first, followed by repurposed drugs and then by regimens.

^b New chemical class.

^c Optimized background regimen.

Source: Adapted from the Working Group on New TB Drugs pipeline. More information on these products and other ongoing projects can be found at <http://www.newtbdrugs.org/pipeline.php>

The global development pipeline for new TB vaccines, August 2018^a

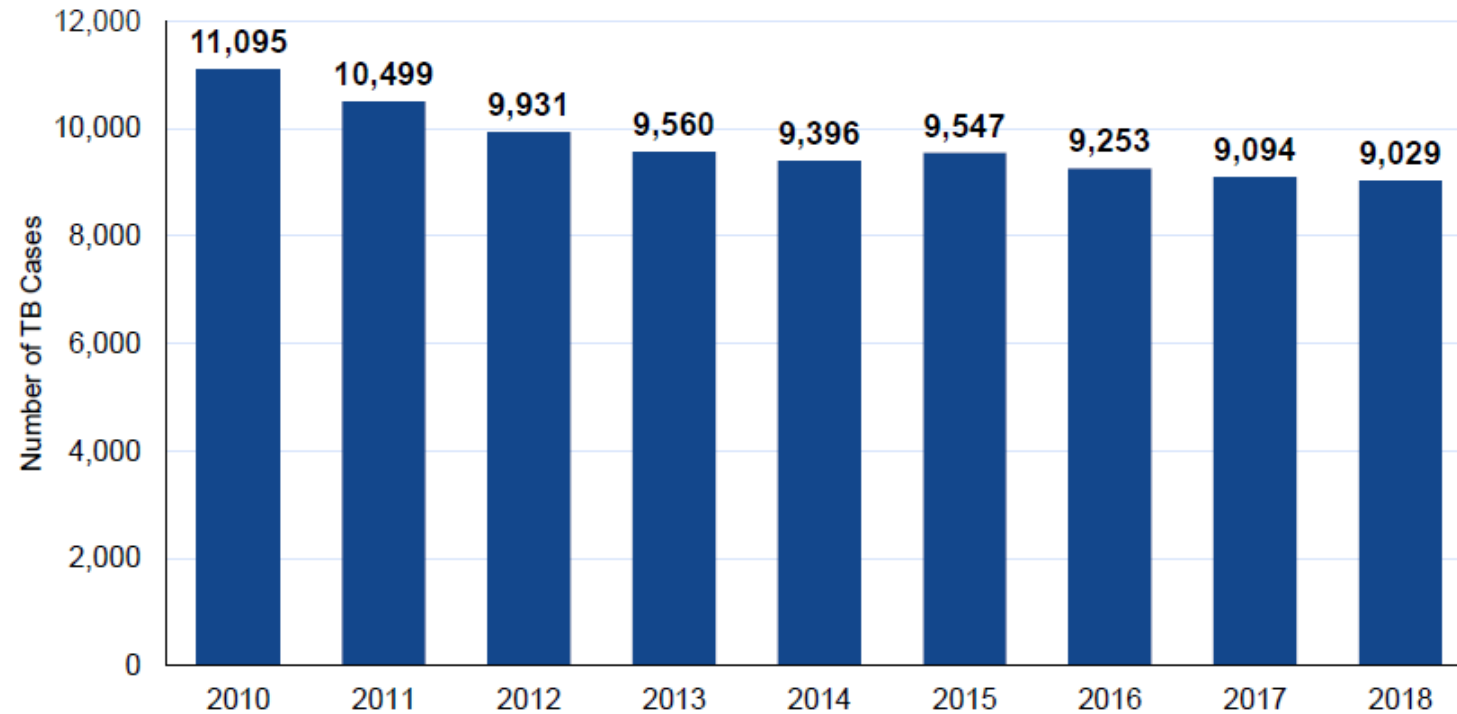


^a Information was self-reported by vaccine sponsors, and the Stop TB Partnership Working Group on New TB Vaccines supported the review of their feedback.

Tuberculosis in the United States, 2018

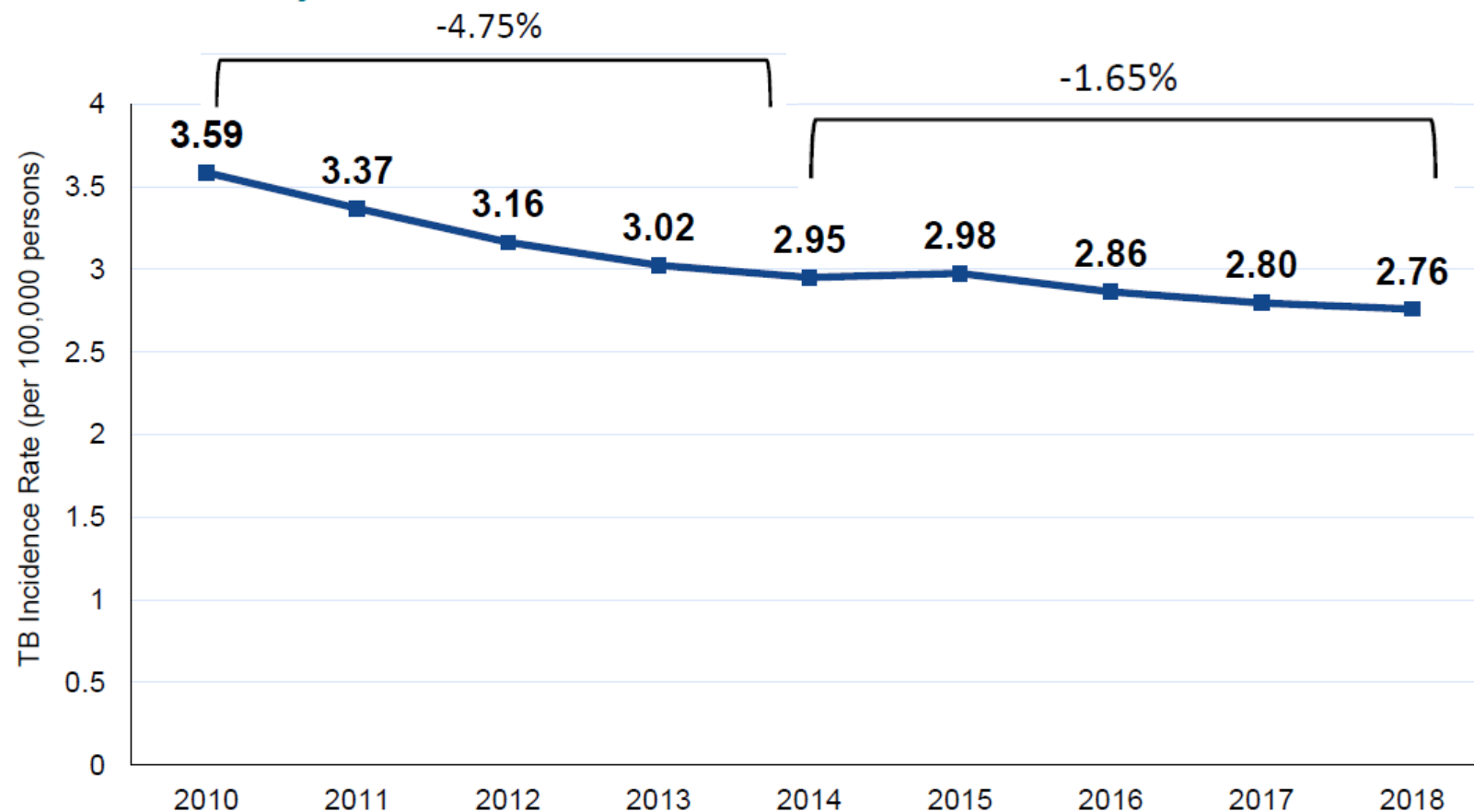
- Provisional 2018 United States case count: 9,029
- Provisional 2018 United States case rate: 2.76 per 100,000 population.
- This is the lowest rate and number of TB cases on record.

Tuberculosis Case Counts* — United States, 2010–2018



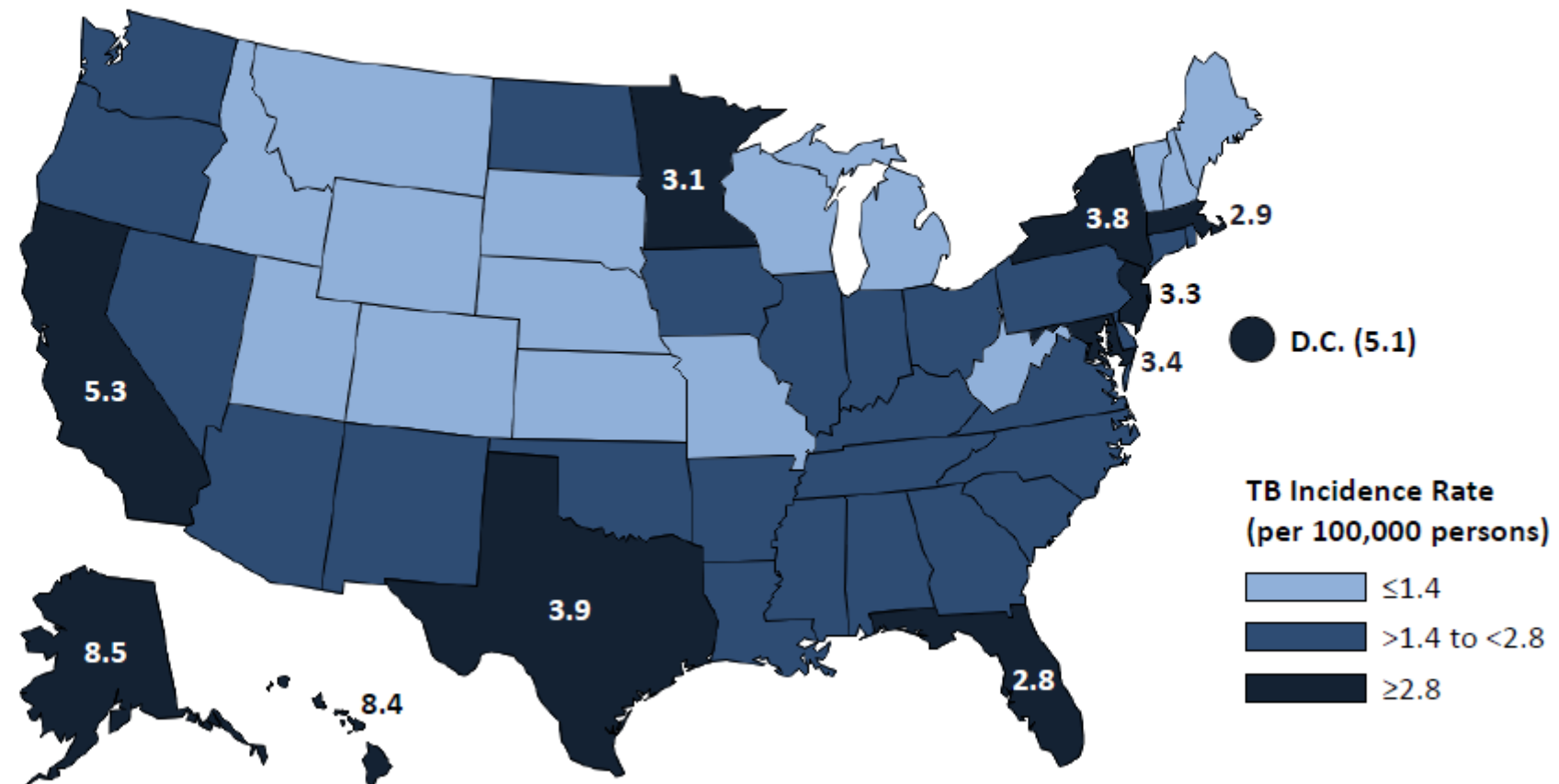
*Based on provisional NTSS data as of February 11, 2019

Tuberculosis Incidence Rates* — United States, 2010–2018



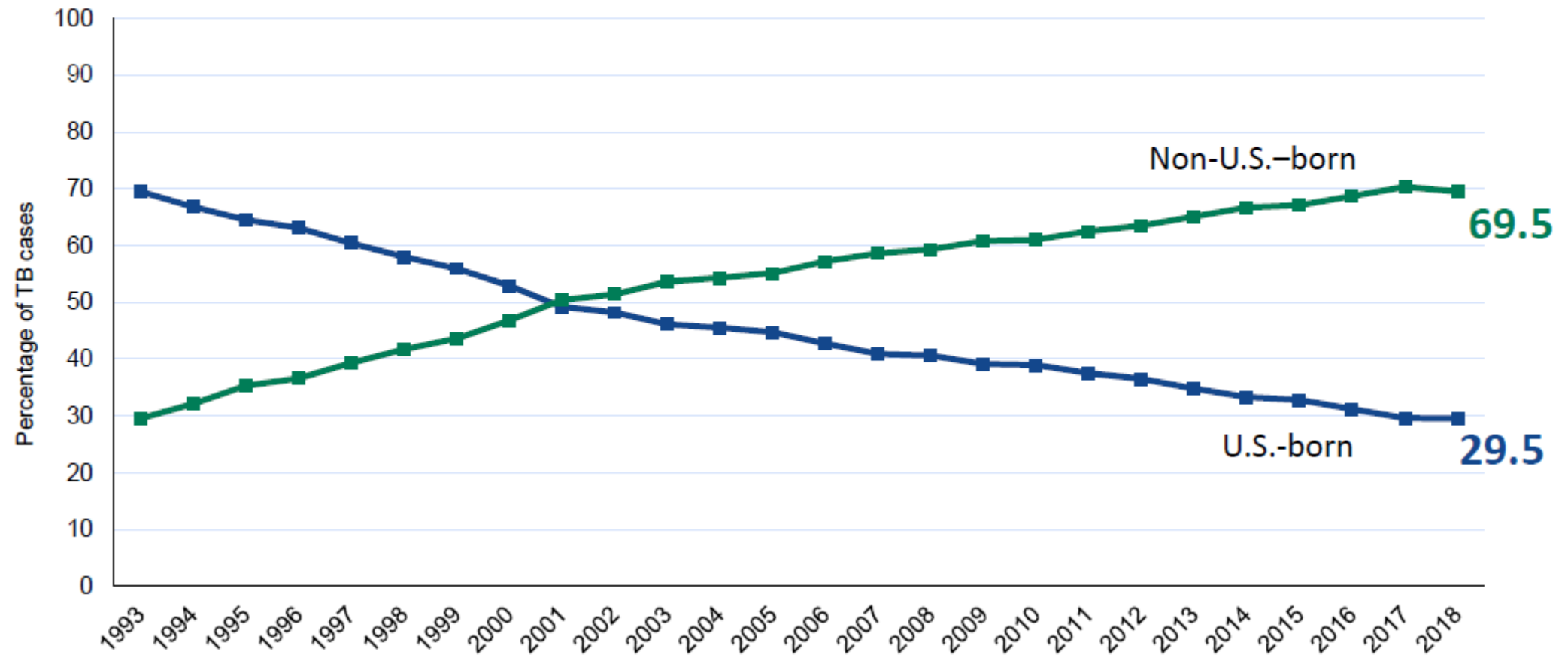
*Based on provisional NTSS data as of February 11, 2019

Tuberculosis Incidence Rates by State* — United States, 2018

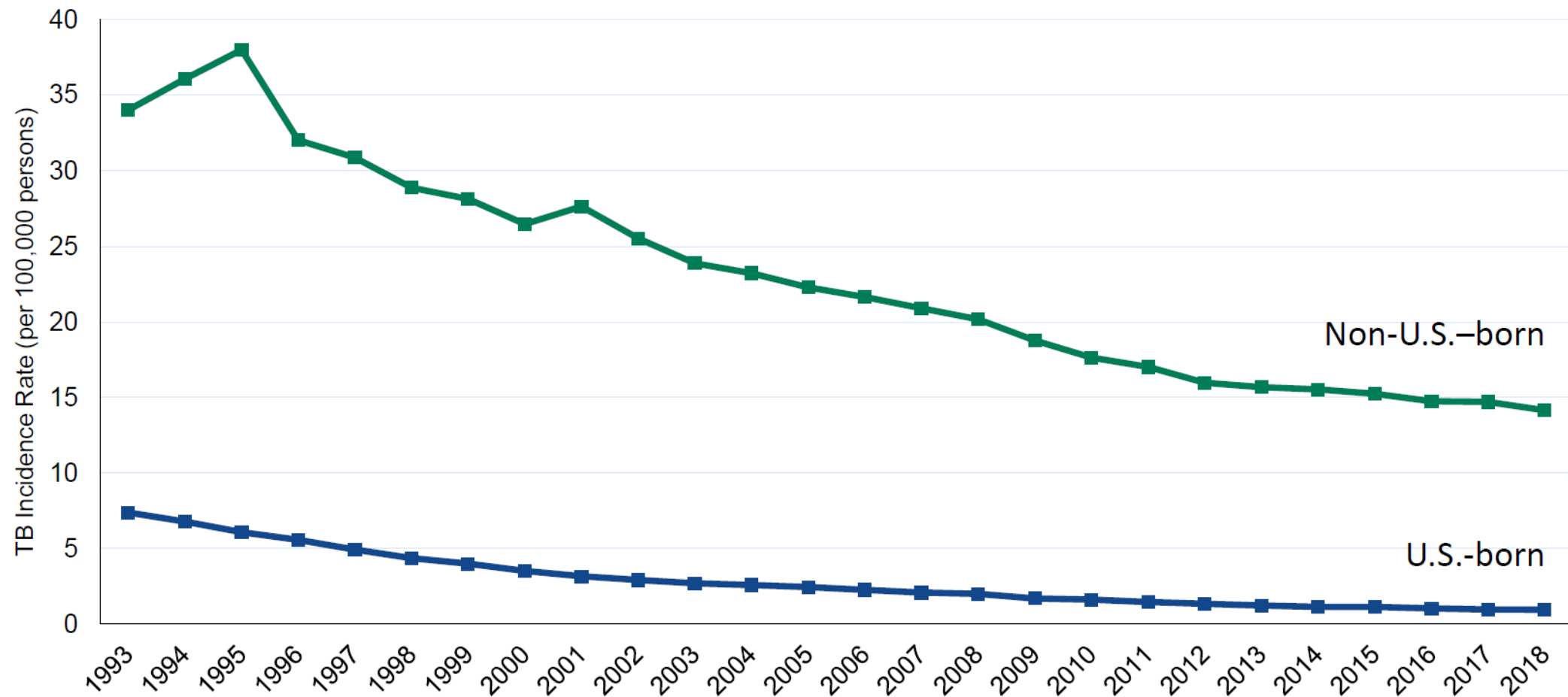


*Based on provisional NTSS data as of February 11, 2019

Percentage of Tuberculosis Cases by Country of Birth* — United States, 1993–2018

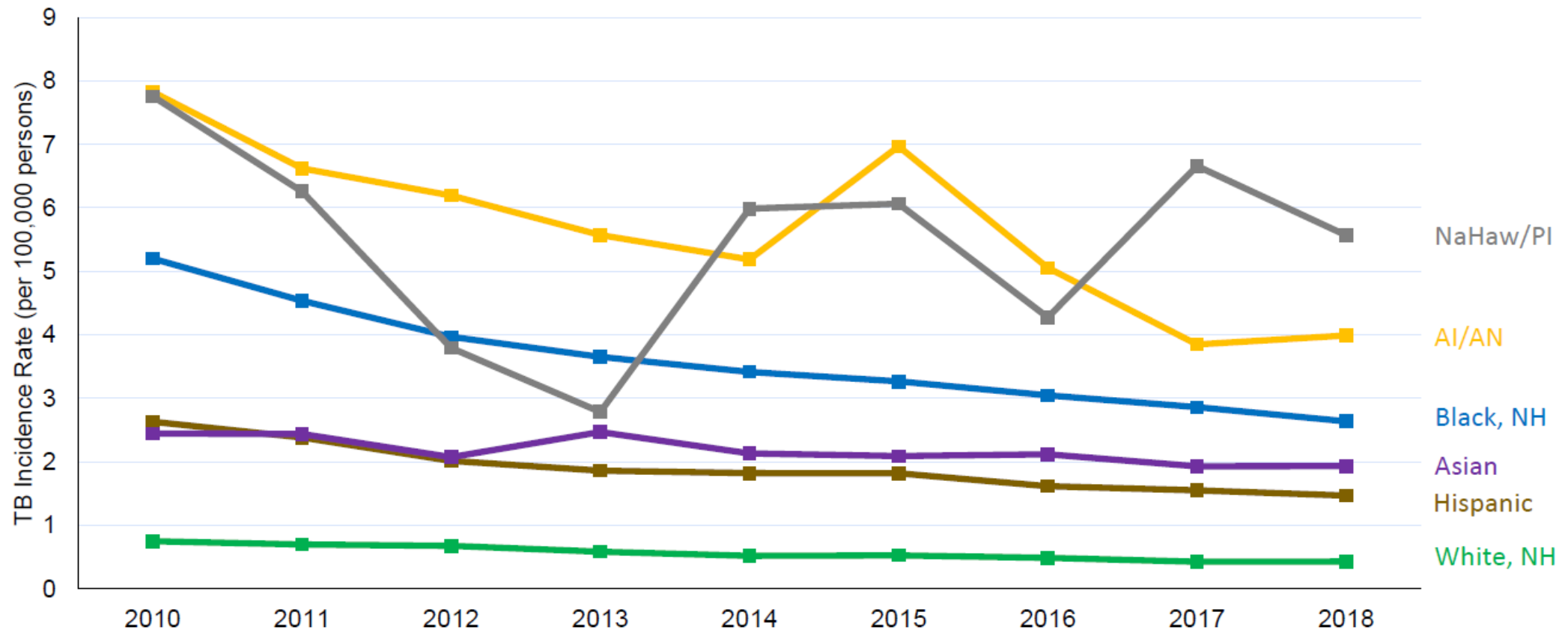


Tuberculosis Incidence Rates by Country of Birth* — United States, 1993–2018



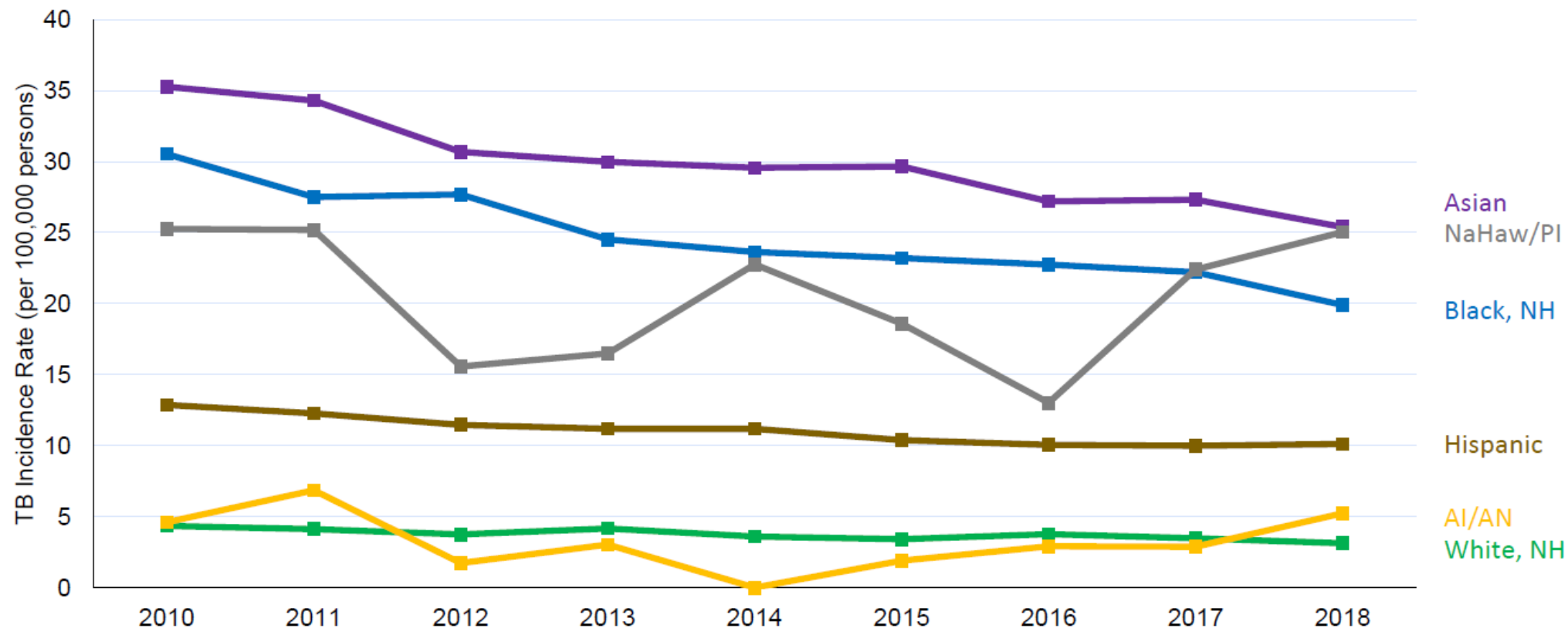
*Based on provisional NTSS data as of February 11, 2019

Tuberculosis Incidence Rates by Race/Ethnicity among U.S.-Born Persons* — United States, 2010–2018



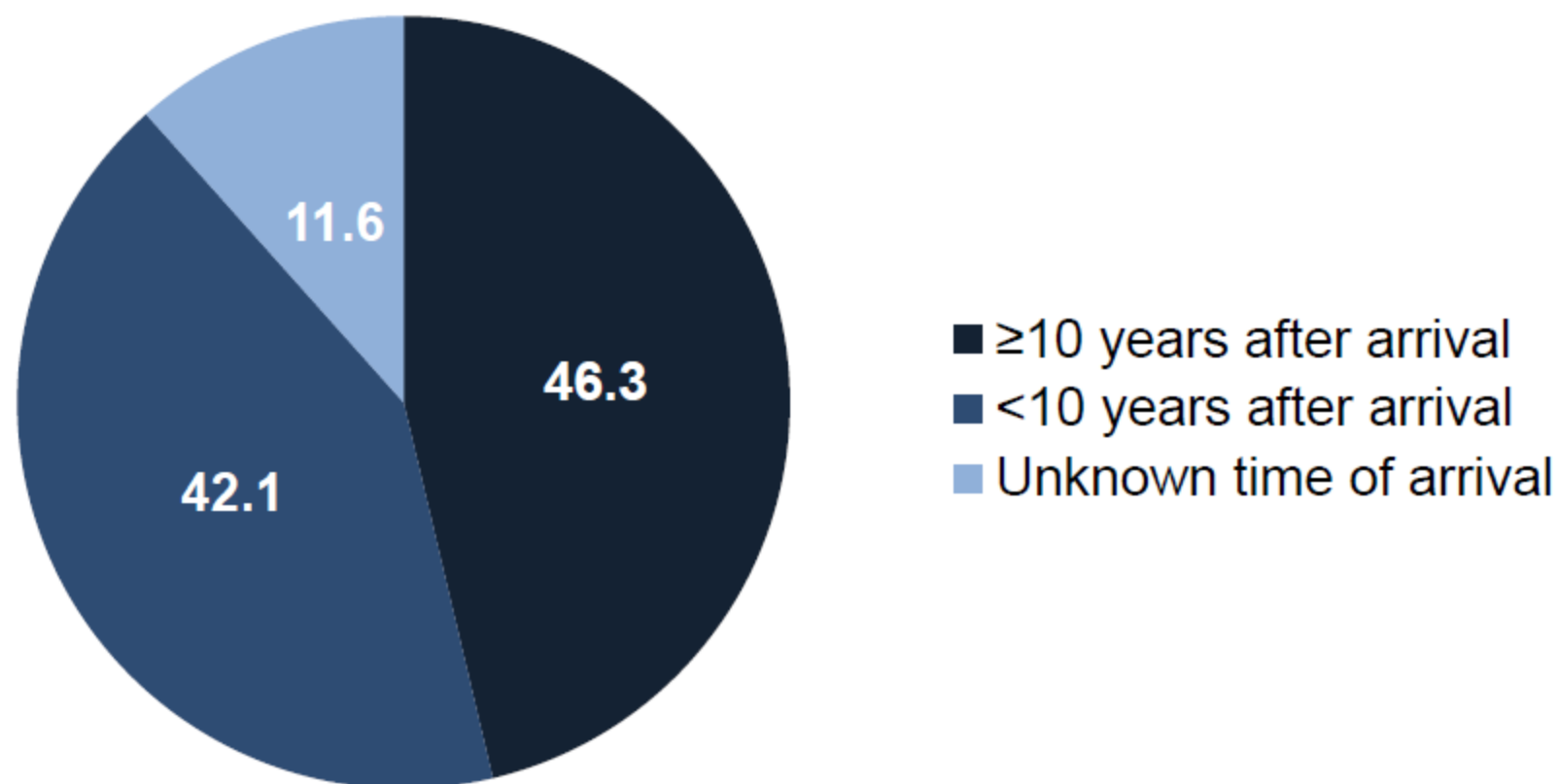
*Based on provisional NTSS data as of February 11, 2019

Tuberculosis Incidence Rates by Race/Ethnicity among Non-U.S.–Born Persons* — United States, 2010–2018



*Based on provisional NTSS data as of February 11, 2019

Percentage of Non-U.S.–Born Tuberculosis Cases by Time of Arrival in United States* — 2018



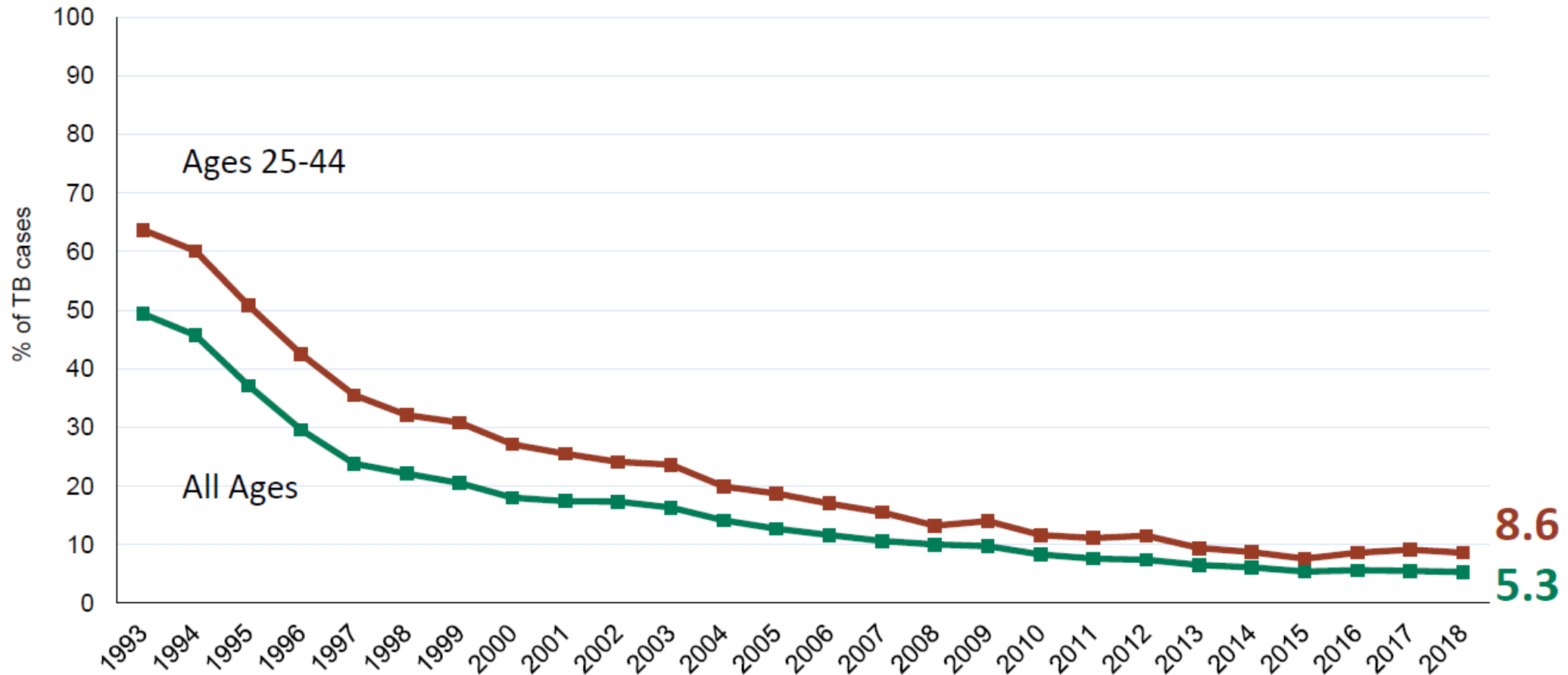
*Based on provisional NTSS data as of February 11, 2019

MDR and XDR Tuberculosis Cases* — United States, 2017

- **MDR TB – 128 cases**
 - Non-U.S.-born – **110** cases
 - Prior history of TB – **26** cases
- **XDR TB – 3 cases**
 - Non-U.S.-born – **3** cases
 - Prior history of TB – **1** case

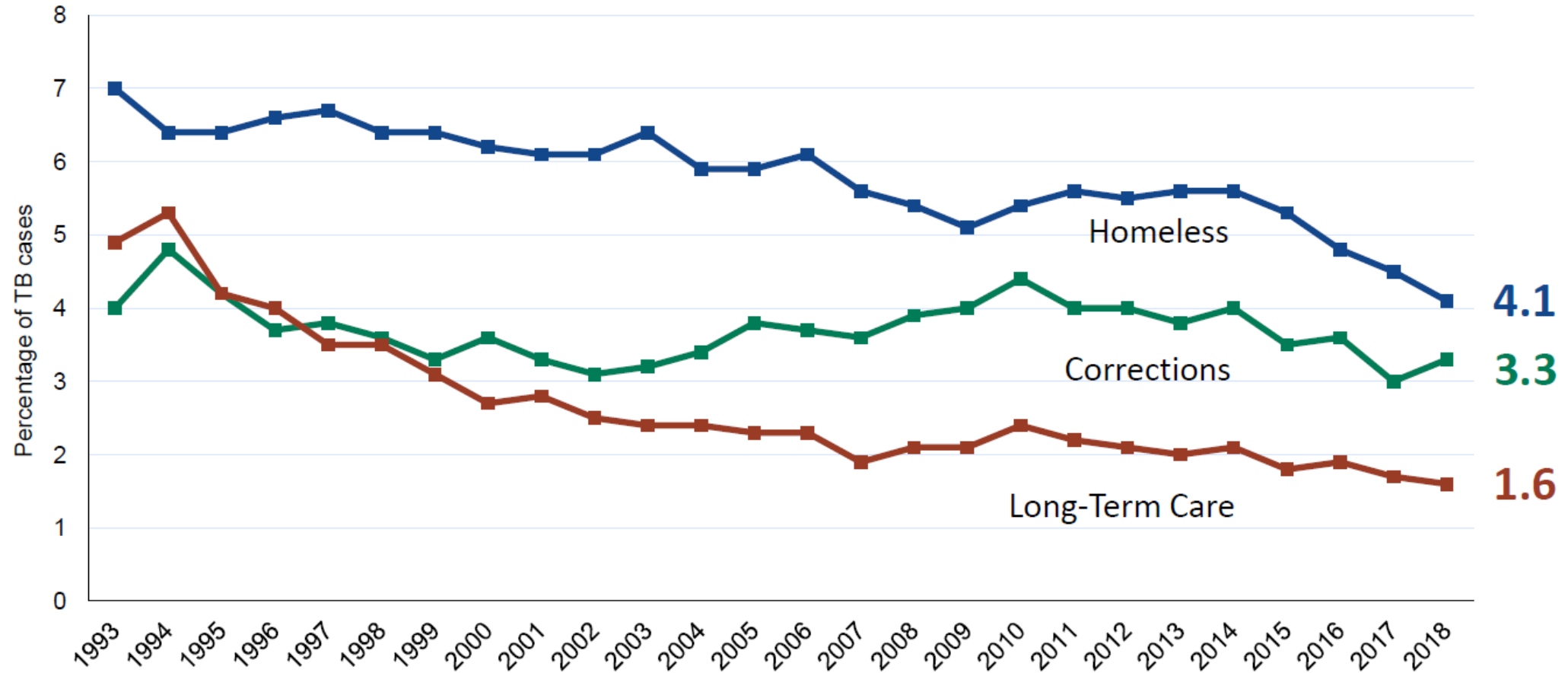
*Based on provisional NTSS data as of February 11, 2019

Annual Percentage of Tuberculosis Cases with HIV Coinfection^{*,†} — United States, 1993–2018



*Based on provisional NTSS data as of February 11, 2019

Annual Percentage of Tuberculosis Cases by Congregate Setting and Homelessness* — United States, 1993–2018



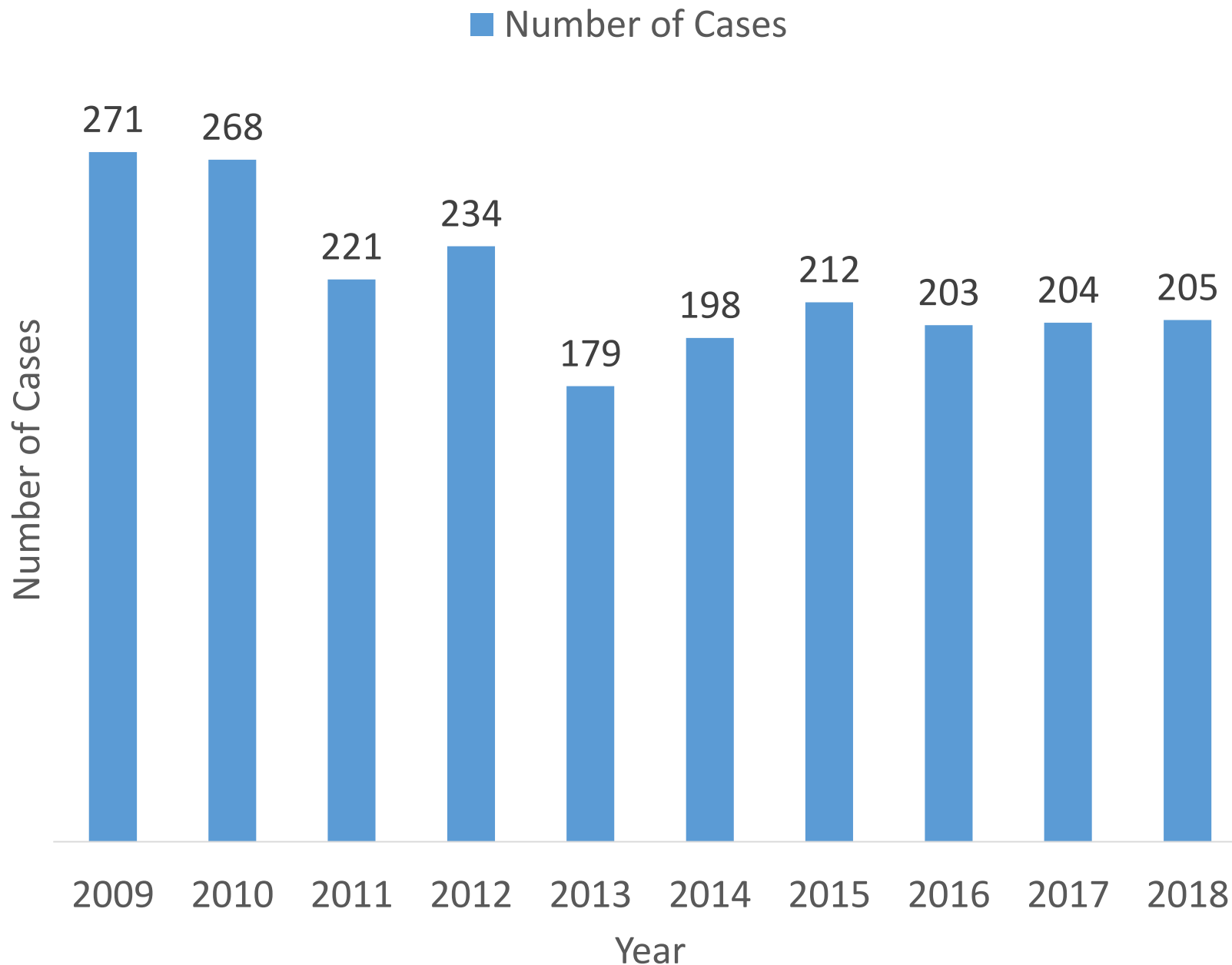
*Based on provisional NTSS data as of February 11, 2019

Tuberculosis in Virginia, 2018*

- 205 cases in 2018
- Rate of 2.4 per 100,000 population

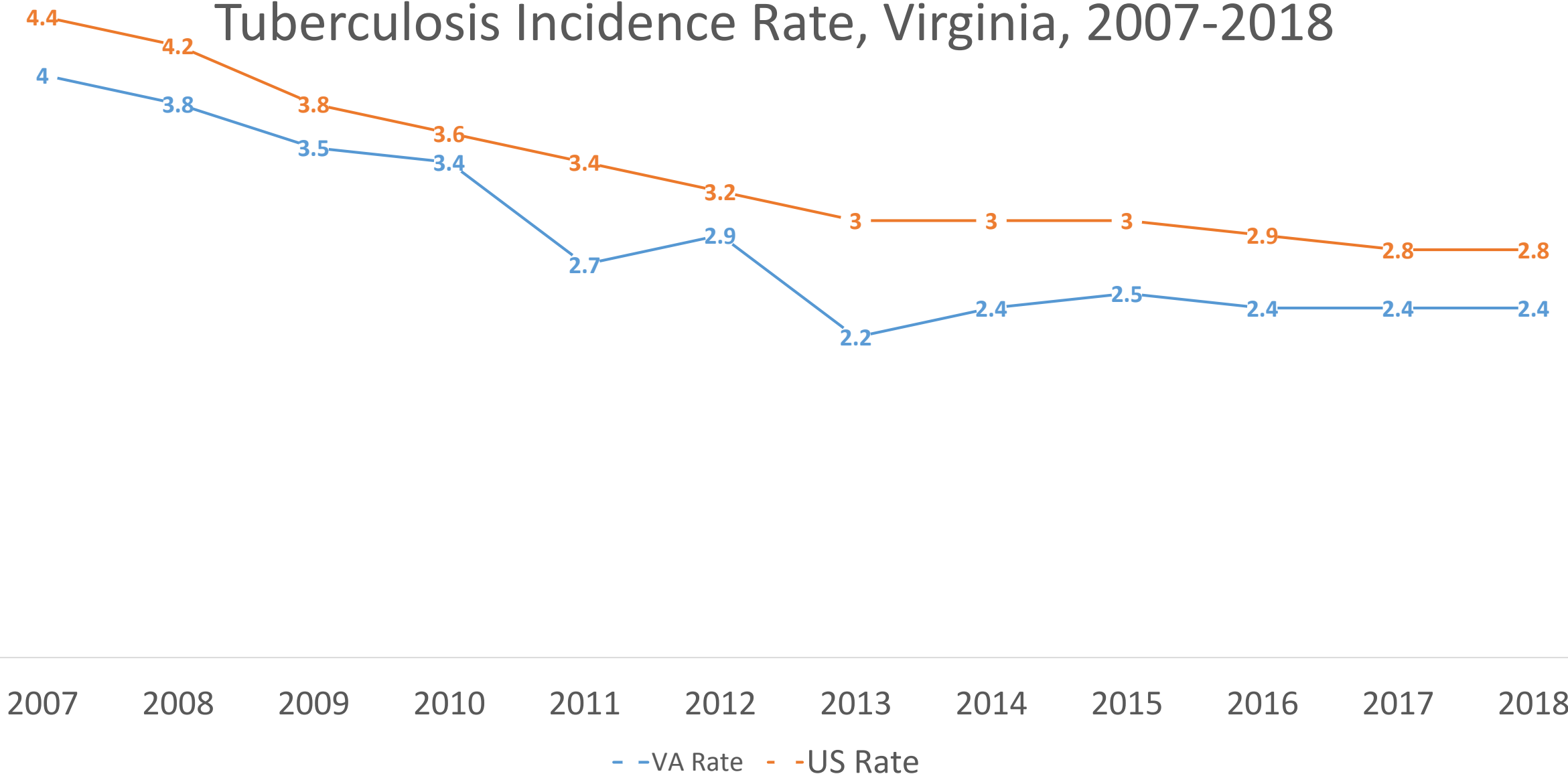
*Data is provisional

Tuberculosis Cases, Virginia, 2009-2018

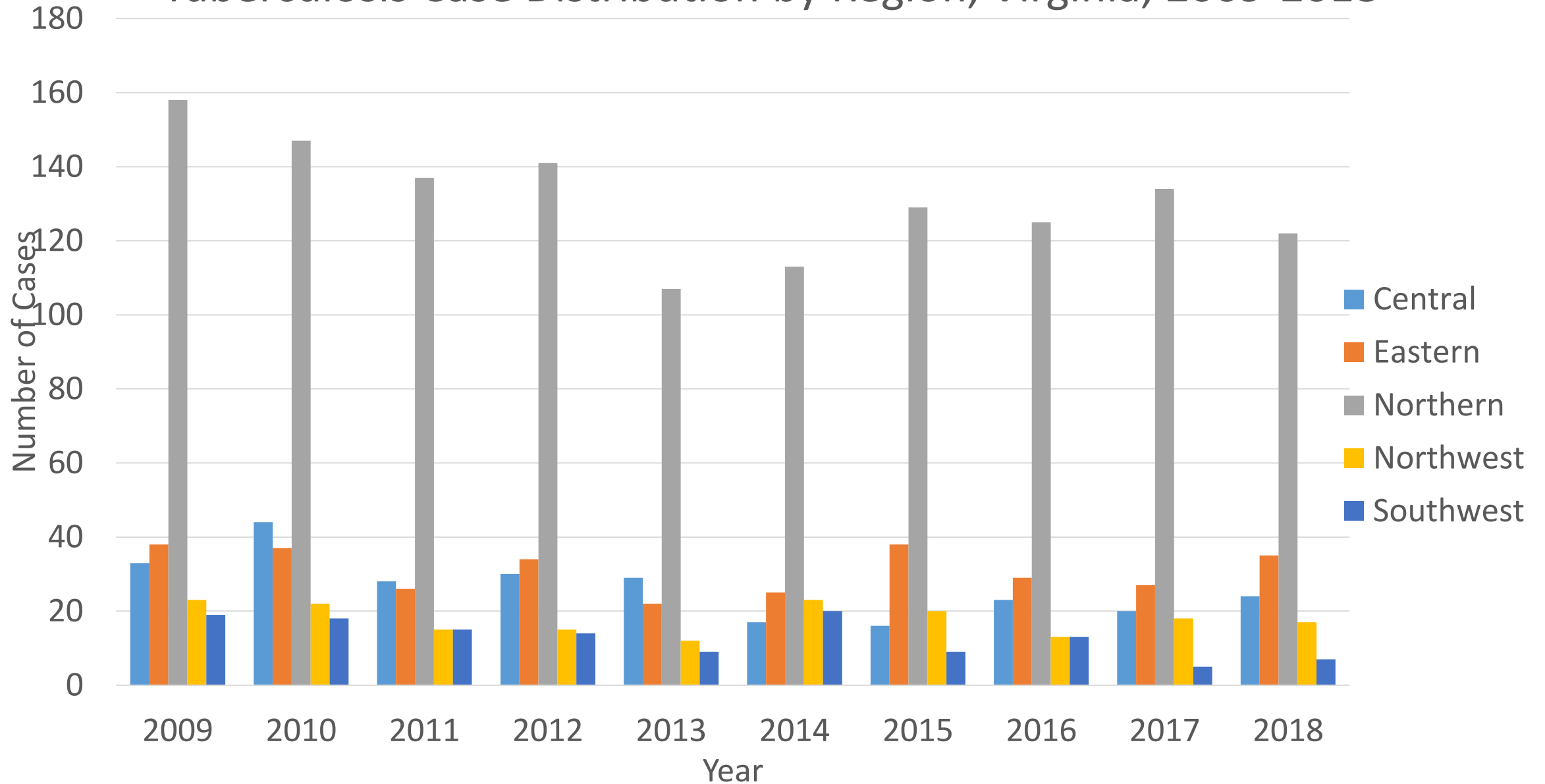


Tuberculosis Incidence Rate, Virginia, 2007-2018

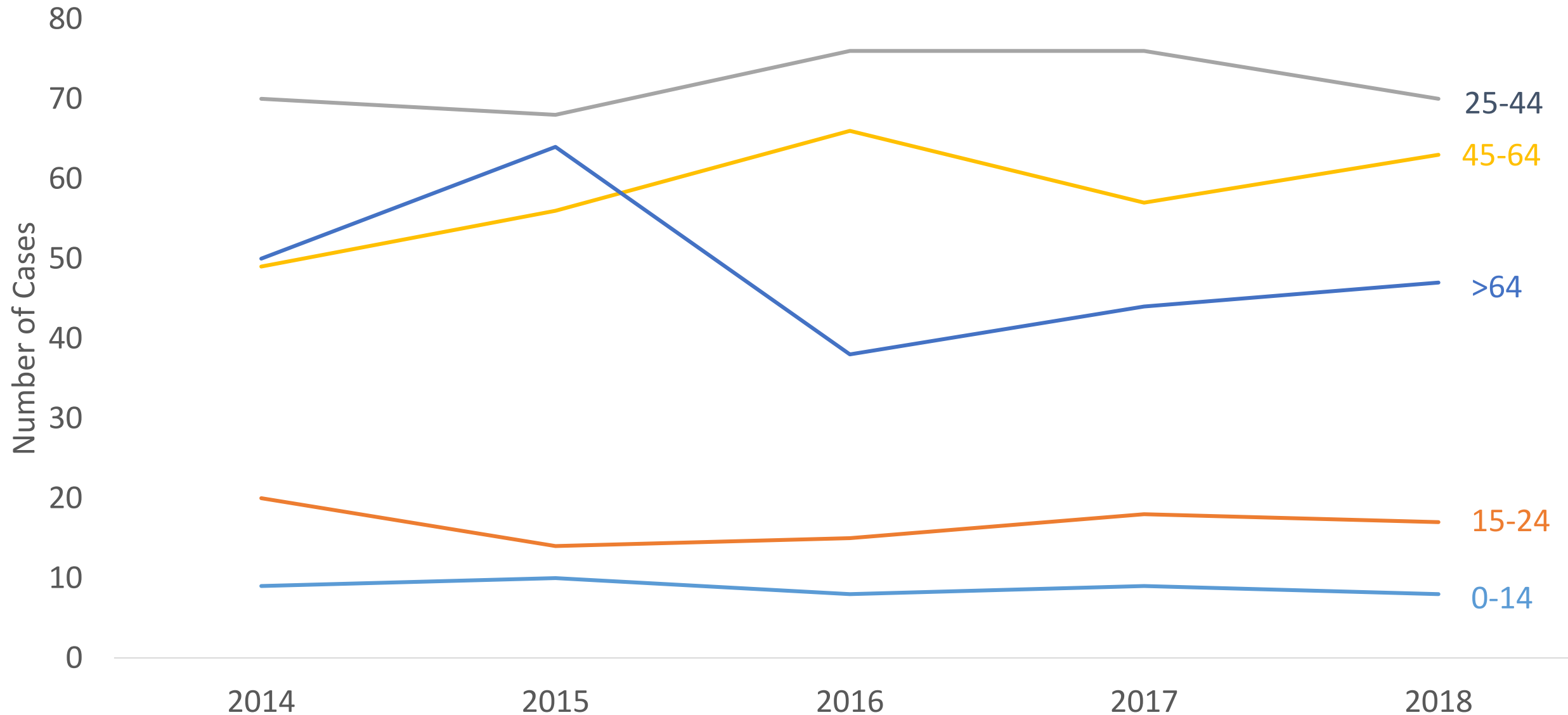
Rate per 100,000 Population



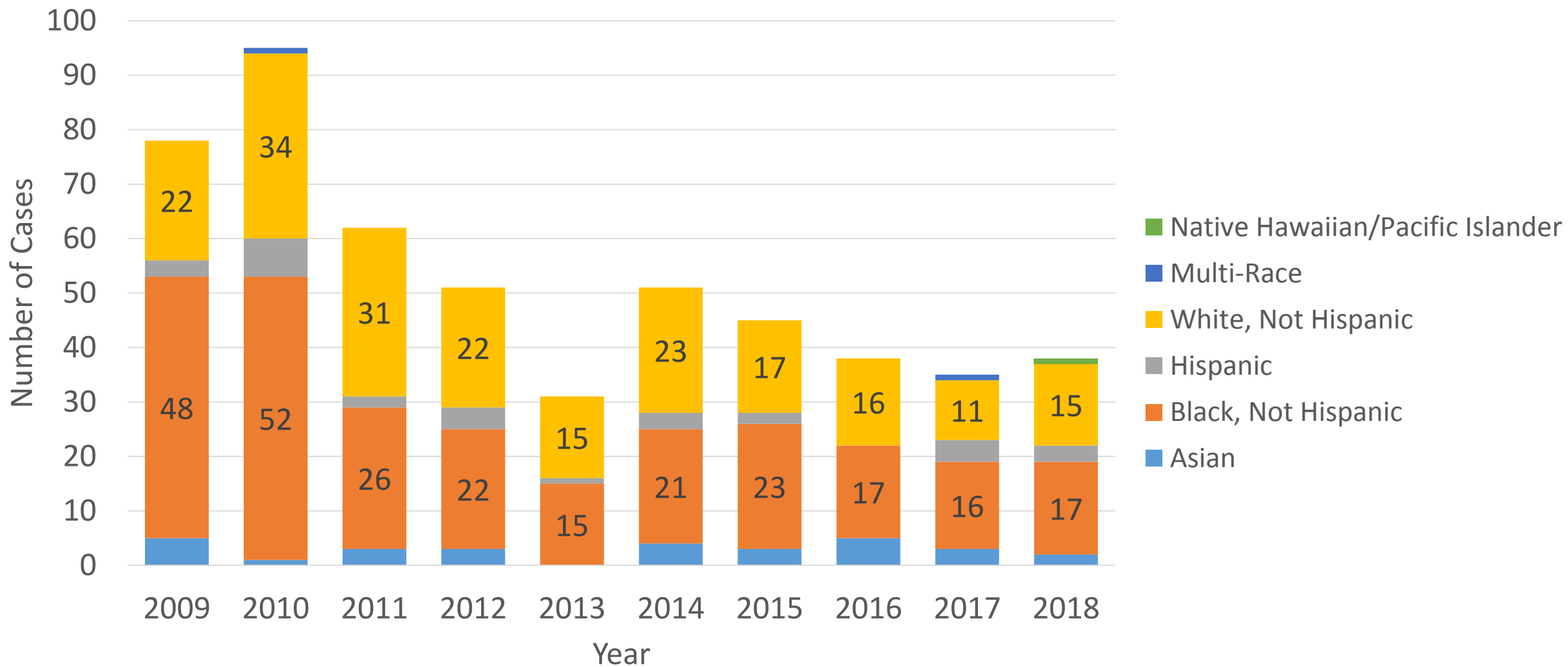
Tuberculosis Case Distribution by Region, Virginia, 2009-2018



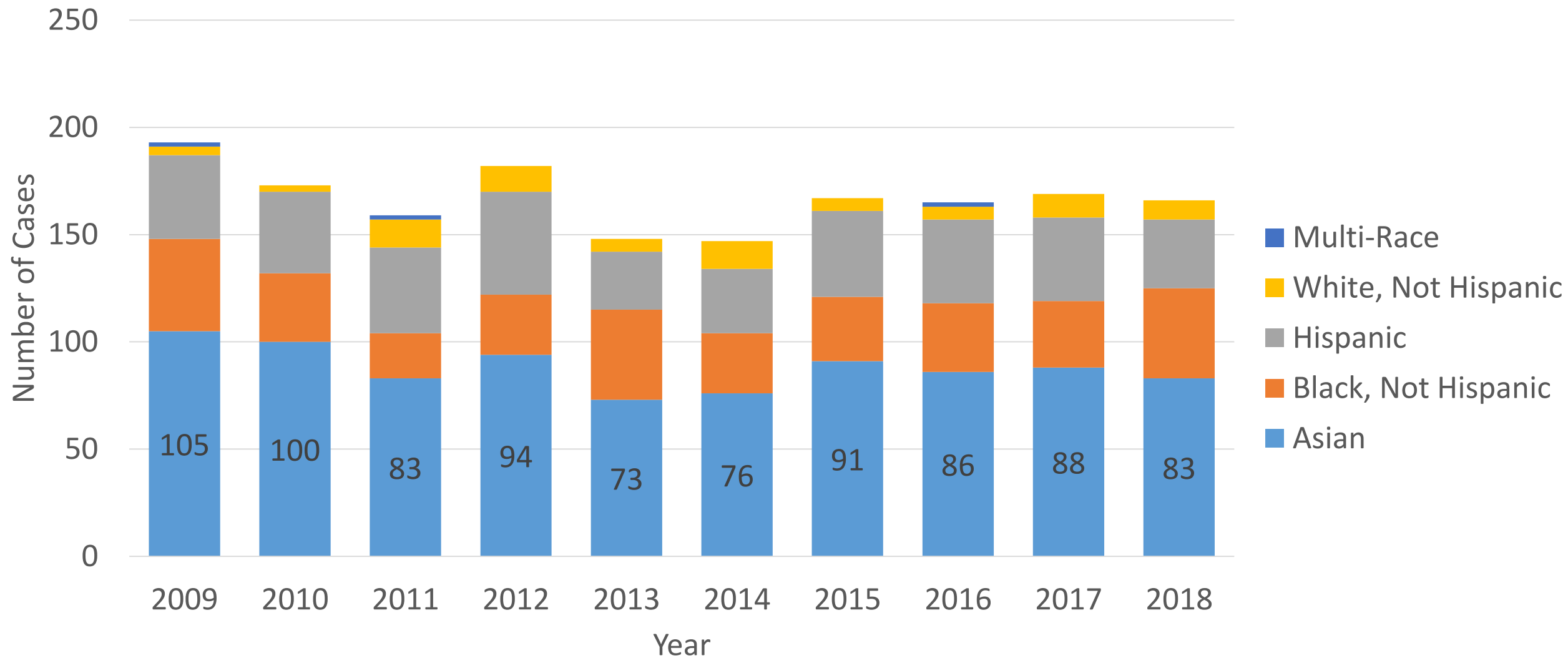
Age Group of Tuberculosis Cases in Years, Virginia, 2014-2018



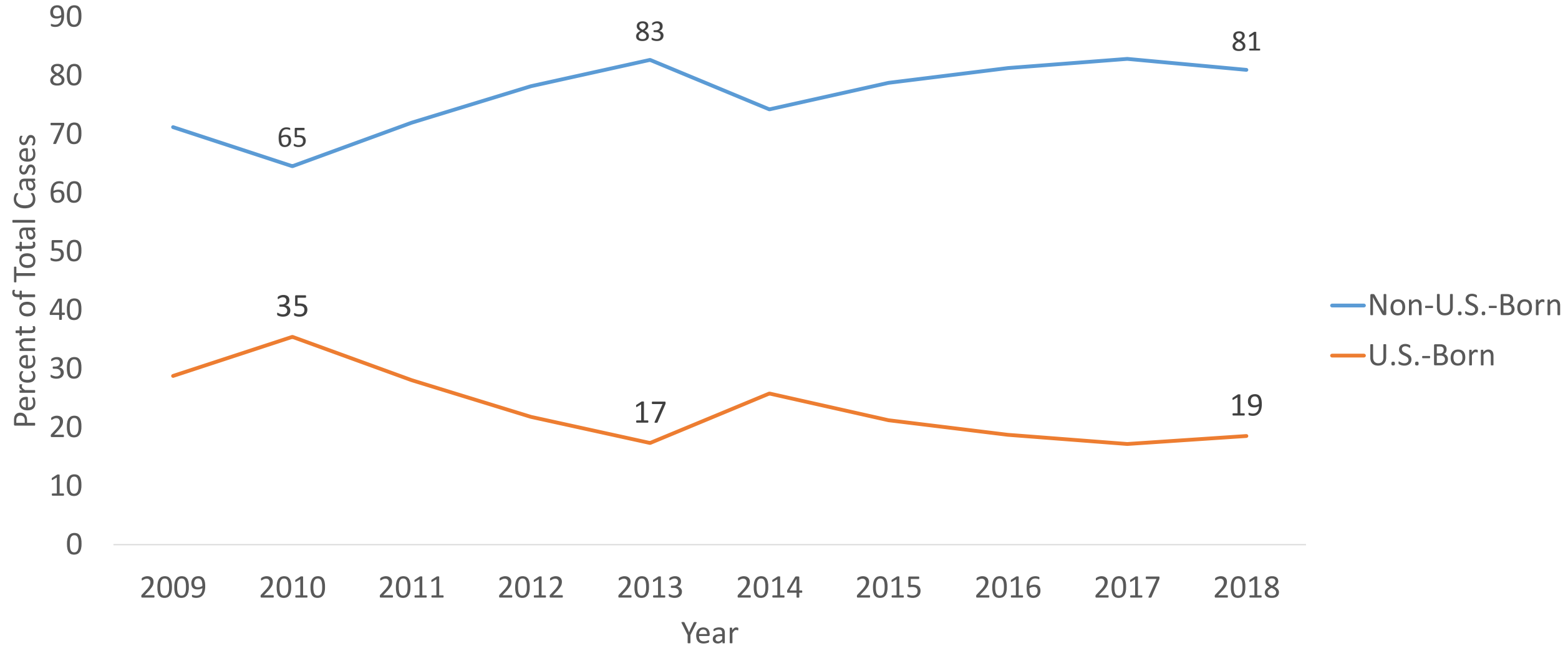
Tuberculosis Cases by Race and Ethnicity Among U.S.-Born Cases, Virginia 2009-2018



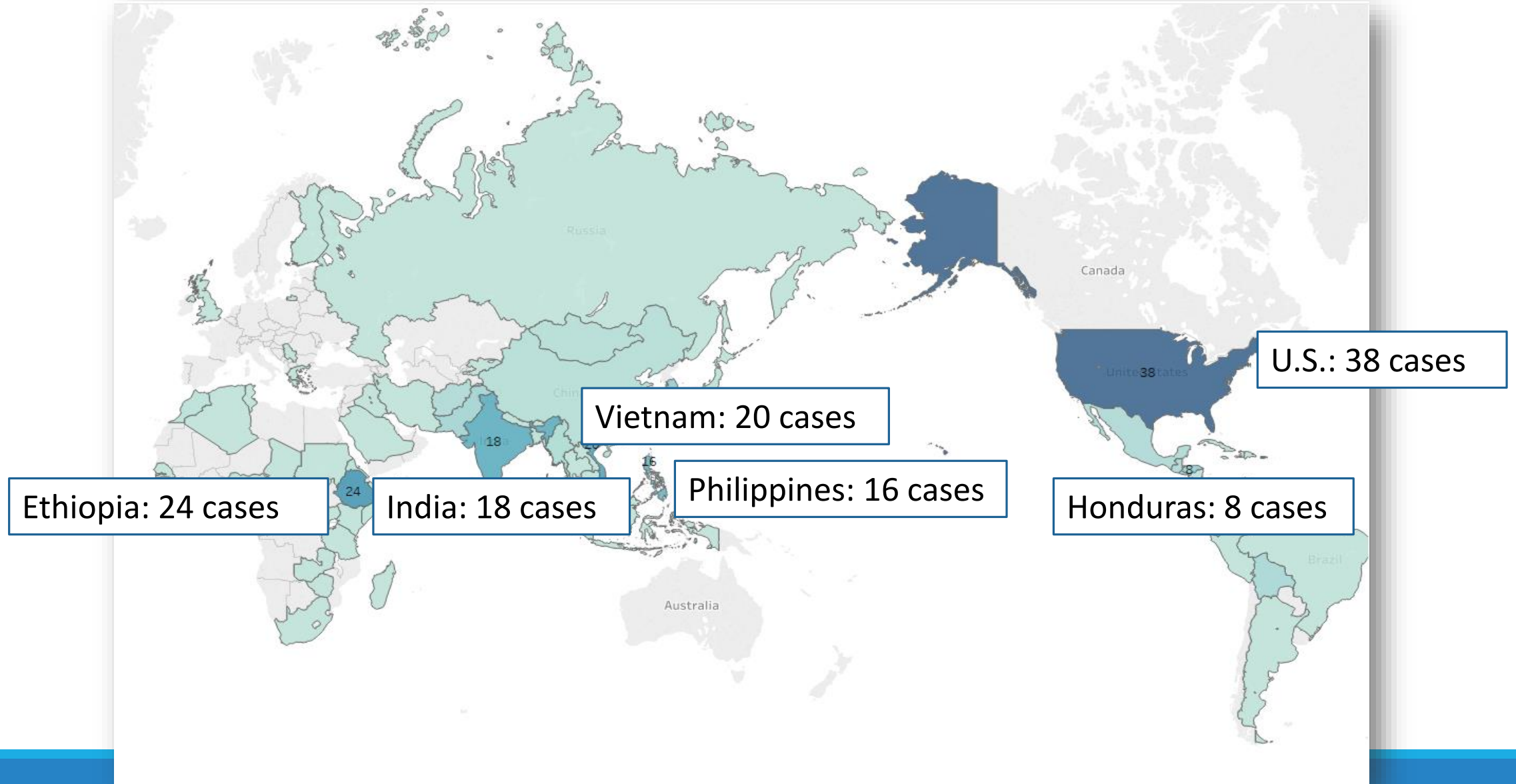
Tuberculosis Cases by Race and Ethnicity Among Non-U.S.-Born Cases, Virginia 2009-2018



Percent of Total Tuberculosis Cases by Nativity, Virginia, 2009-2018



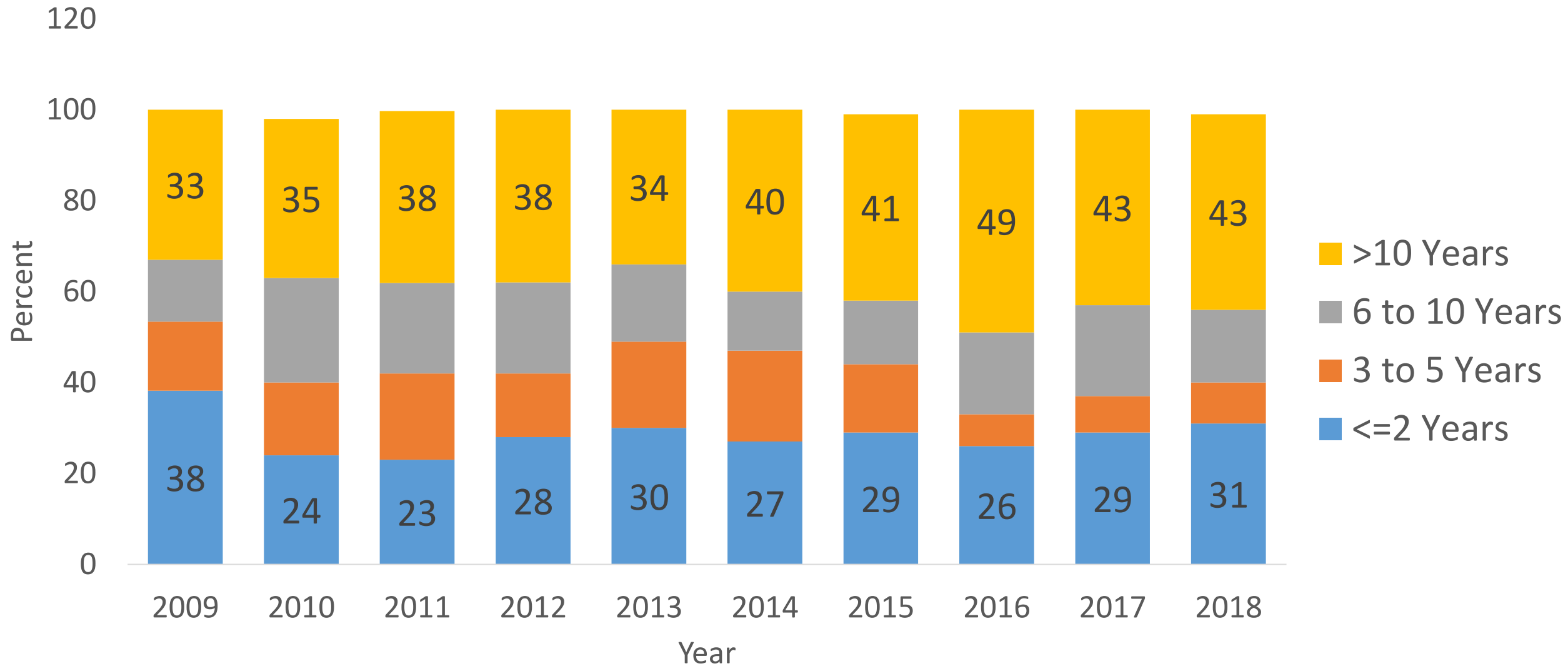
County of Birth of Tuberculosis Cases, Virginia, 2018



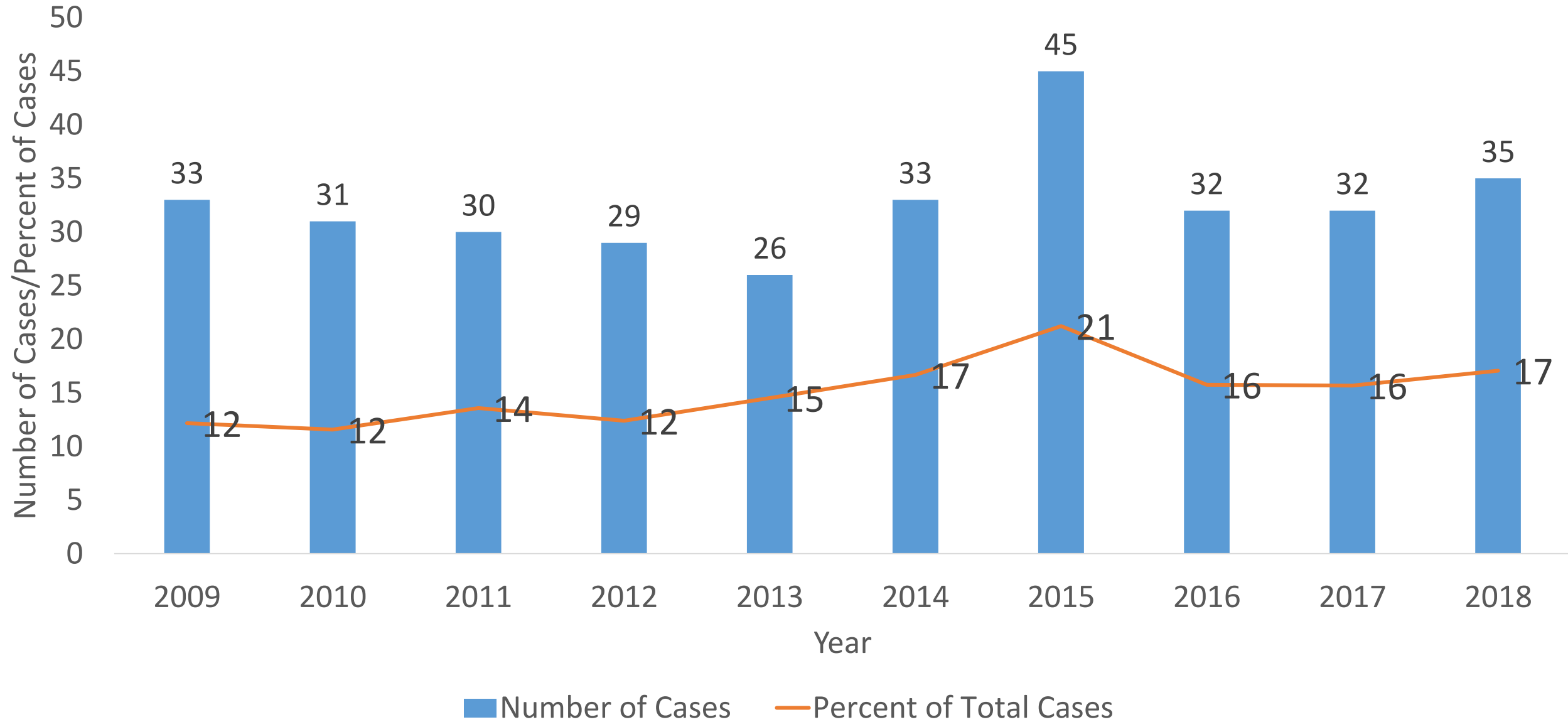
Top Five Countries of Birth Among Non-US—Born TB Cases, Virginia, 2014-2018

	2014	2015	2016	2017	2018
1	India	Philippines	India	Philippines	Ethiopia
2	Vietnam	India	Philippines	India	Vietnam
3	Ethiopia	Vietnam	Ethiopia	Ethiopia	India
4	Philippines &	Ethiopia	Vietnam	Vietnam	Philippines
	El Salvador &				
	South Korea				
5	Nepal &	South Korea	Honduras	Guatemala	Honduras &
	Pakistan				South Korea

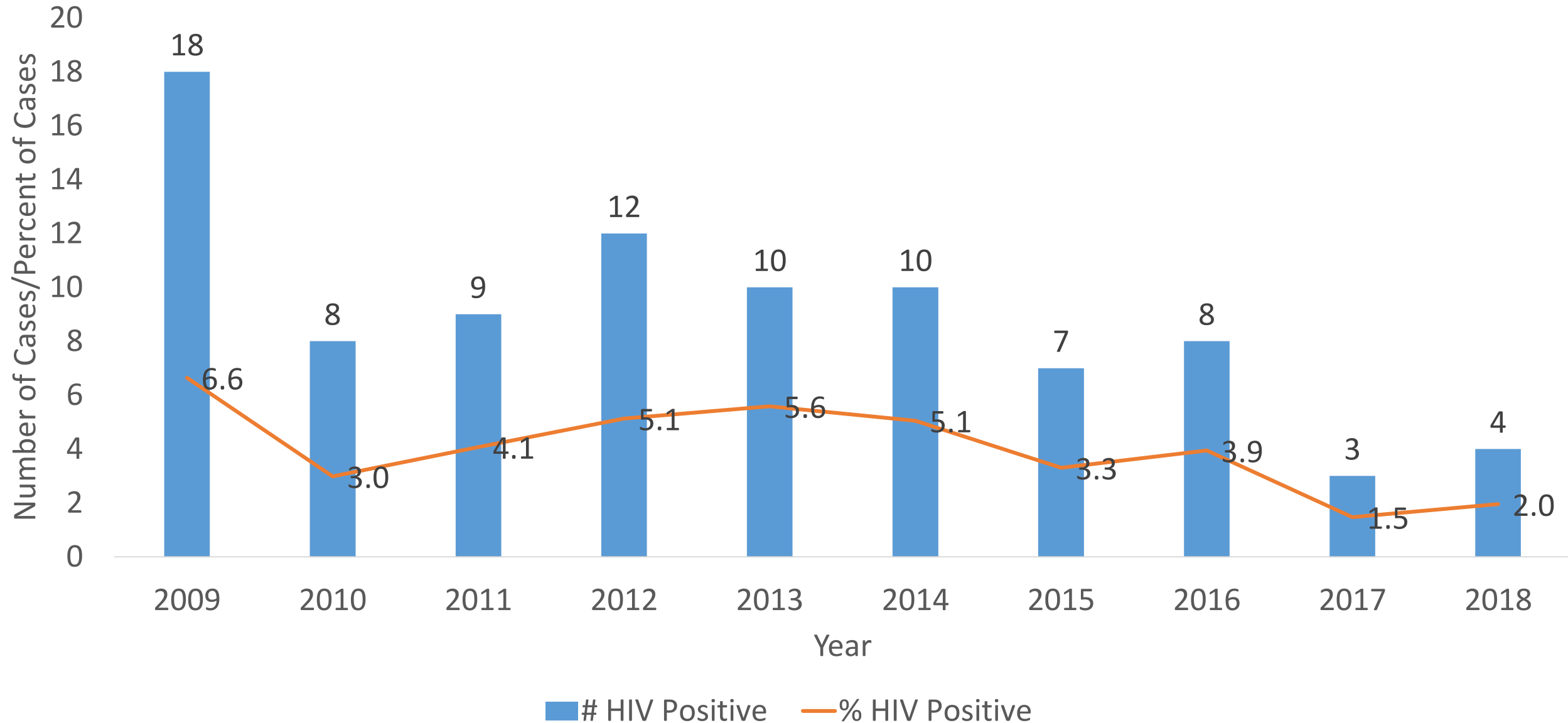
Tuberculosis Cases among Non-U.S.-Born Persons by Time of Residence in the U.S., Virginia, 2009-2018



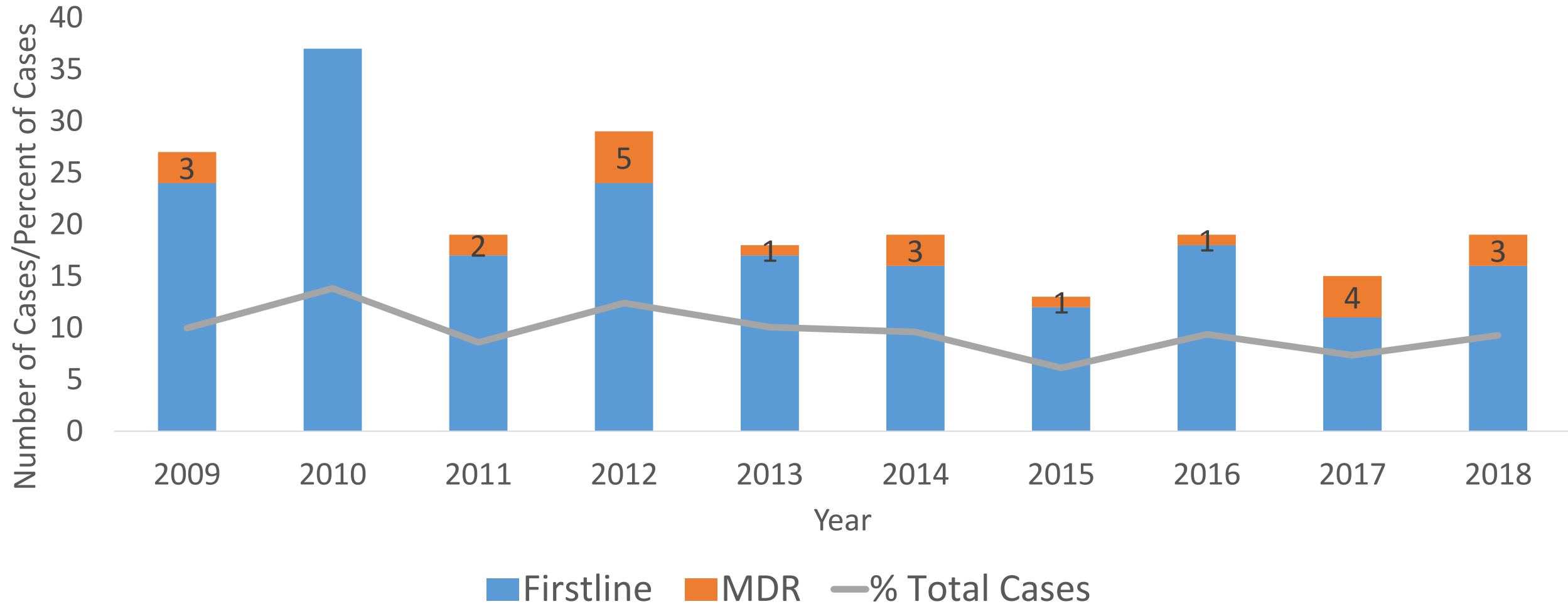
Tuberculosis Cases with Diabetes, Virginia, 2009-2018



Tuberculosis Cases with HIV Co-Infection, Virginia, 2009-2018



Drug Resistance Among Tuberculosis Cases, Virginia, 2009-2018



How to we continue down from the plateau?



Year

Addressing TB Infection

- Education
- Surveillance
- Testing
- Treatment

Reporting of the following diseases is required by state law (Sections 32.1-36 and 32.1-37 of the Code of Virginia and 12 VAC 5-90-80 of the Board of Health Regulations for Disease Reporting and Control – <http://www.vdh.virginia.gov/surveillance-and-investigation/division-of-surveillance-and-investigation/commonwealth-of-virginiastate-board-of-health/>). Report all conditions when suspected or confirmed to your local health department (LHD). Reports may be submitted by computer-generated printout, Epi-1 form, CDC or VDH surveillance form, or upon agreement with VDH, by means of secure electronic submission.

BOLD = Laboratories must submit initial isolate or other initial specimen to the Division of Consolidated Laboratory Services (DCLS) within 7 days of identification. All specimens must be identified with patient and physician information, and the LHD must be notified within the timeframe specified below.

REPORT IMMEDIATELY	REPORT WITHIN 3 DAYS
<p>Anthrax (<i>Bacillus anthracis</i>) [a]</p> <p>Botulism (<i>Clostridium botulinum</i>) [a]</p> <p>Brucellosis (<i>Brucella</i> spp.) [a]</p> <p>Cholera (<i>Vibrio cholerae</i> O1/O139) [a]</p> <p>Coronavirus infection, severe (e.g., SARS-CoV, MERS-CoV) [a]</p> <p>Diphtheria (<i>Corynebacterium diphtheriae</i>) [a]</p> <p>Disease caused by an agent that may have been used as a weapon</p> <p>Haemophilus influenzae infection, invasive [a]</p> <p>Hepatitis A [a]</p> <p>Influenza-associated deaths if younger than 18 years of age</p> <p>Influenza A, novel virus [a]</p> <p>Measles (Rubeola) [a]</p> <p>Meningococcal disease (<i>Neisseria meningitidis</i>) [a]</p> <p>Outbreaks, all (including but not limited to foodborne, healthcare-associated, occupational, toxic substance-related, waterborne, and any other outbreak)</p> <p>Pertussis (<i>Bordetella pertussis</i>) [a]</p> <p>Plague (<i>Yersinia pestis</i>) [a]</p> <p>Poliovirus infection, including poliomyelitis [a]</p> <p>Psittacosis (<i>Chlamydia psittaci</i>) [a]</p> <p>Q fever (<i>Coxiella burnetii</i>) [a]</p> <p>Rabies, human and animal [a]</p> <p>Rubella [a], including congenital rubella syndrome [a]</p> <p>Smallpox (Variola virus) [a]</p> <p>Syphilis (<i>Treponema pallidum</i>), congenital, primary, and secondary [a]</p> <p>Tuberculosis, active disease (<i>Mycobacterium tuberculosis</i> complex) [a,b]</p> <p>Tularemia (<i>Francisella tularensis</i>) [a]</p> <p>Typhoid/Paratyphoid infection (<i>Salmonella</i> Typhi, <i>Salmonella</i> Paratyphi) [a]</p> <p>Unusual occurrence of disease of public health concern</p> <p>Vaccinia, disease or adverse event [a]</p> <p>Vibriosis (<i>Vibrio</i> spp.) [a,e]</p> <p>Viral hemorrhagic fever [a]</p> <p>Yellow fever [a]</p>	<p>Amebiasis (<i>Entamoeba histolytica</i>) [a]</p> <p>Arboviral infections (e.g., CHIK, dengue, EEE, LAC, SLE, WNV, Zika) [a]</p> <p>Babesiosis (<i>Babesia</i> spp.) [a]</p> <p>Campylobacteriosis (<i>Campylobacter</i> spp.) [a]</p> <p>Candida auris, infection or colonization [a,c]</p> <p>Carbapenemase-producing organism, infection or colonization [a]</p> <p>Chancroid (<i>Haemophilus ducreyi</i>) [a]</p> <p>Chickenpox (Varicella virus) [a]</p> <p><i>Chlamydia trachomatis</i> infection [a]</p> <p>Cryptosporidiosis (<i>Cryptosporidium</i> spp.) [a]</p> <p>Cyclosporiasis (<i>Cyclospora</i> spp.) [a]</p> <p>Ehrlichiosis/Anaplasmosis (<i>Ehrlichia</i> spp., <i>Anaplasma phagocytophilum</i>) [a]</p> <p>Giardiasis (<i>Giardia</i> spp.) [a]</p> <p>Gonorrhea (<i>Neisseria gonorrhoeae</i>) [a]</p> <p>Granuloma inguinale (<i>Calymatobacterium granulomatis</i>)</p> <p>Hantavirus pulmonary syndrome [a]</p> <p>Hemolytic uremic syndrome (HUS)</p> <p>Hepatitis B (acute and chronic) [a]</p> <p>Hepatitis C (acute and chronic) [a]</p> <p>Hepatitis, other acute viral [a]</p> <p>Human immunodeficiency virus (HIV) infection [a]</p> <p>Influenza, confirmed seasonal strain [a]</p> <p>Lead, blood levels [a]</p> <p>Legionellosis (<i>Legionella</i> spp.) [a]</p> <p>Leprosy/Hansen's disease (<i>Mycobacterium leprae</i>)</p> <p>Leptospirosis (<i>Leptospira interrogans</i>) [a]</p> <p>Listeriosis (<i>Listeria monocytogenes</i>) [a]</p> <p>Lyme disease (<i>Borrelia</i> spp.) [a]</p> <p>Lymphogranuloma venereum (<i>Chlamydia trachomatis</i>)</p> <p>Malaria (<i>Plasmodium</i> spp.) [a]</p> <p>Mumps [a]</p> <p>Neonatal abstinence syndrome (NAS)</p> <p>Ophthalmia neonatorum</p> <p>Rabies treatment, post-exposure</p> <p>Salmonellosis (<i>Salmonella</i> spp.) [a]</p> <p>Shiga toxin-producing Escherichia coli infection [a,d]</p> <p>Shigellosis (<i>Shigella</i> spp.) [a]</p> <p>Spotted fever rickettsiosis (<i>Rickettsia</i> spp.) [a]</p> <p>Streptococcal disease, Group A, invasive or toxic shock [a]</p> <p><i>Streptococcus pneumoniae</i> infection, invasive and <5 years of age [a]</p> <p>Syphilis (<i>Treponema pallidum</i>), if not primary, secondary, or congenital</p> <p>Tetanus (<i>Clostridium tetani</i>)</p> <p>Toxic substance-related illness [a]</p> <p>Trichinellosis (<i>Trichinella spiralis</i>) [a]</p> <p>Tuberculosis infection [a]</p> <p>Vancomycin-intermediate or vancomycin-resistant Staphylococcus aureus infection [a]</p> <p>Yersiniosis (<i>Yersinia</i> spp.) [a]</p>
LEGEND	
<p>[a] Reportable by directors of laboratories. These and all other conditions listed must be reported by physicians and directors of medical care facilities.</p> <p>[b] Laboratories report AFB, <i>M. tuberculosis</i> complex or any other mycobacteria, and antimicrobial susceptibility for <i>M. tuberculosis</i> complex.</p> <p>[c] Includes submission of <i>Candida haemulonii</i> specimens to DCLS.</p> <p>[d] Laboratories that use EIA without a positive culture should forward positive stool specimens or enrichment broth to DCLS.</p> <p>[e] Includes reporting of <i>Photobacterium damsela</i> and <i>Grimontia hollisae</i>.</p>	

Labs Currently Reporting IGRA via ELR:

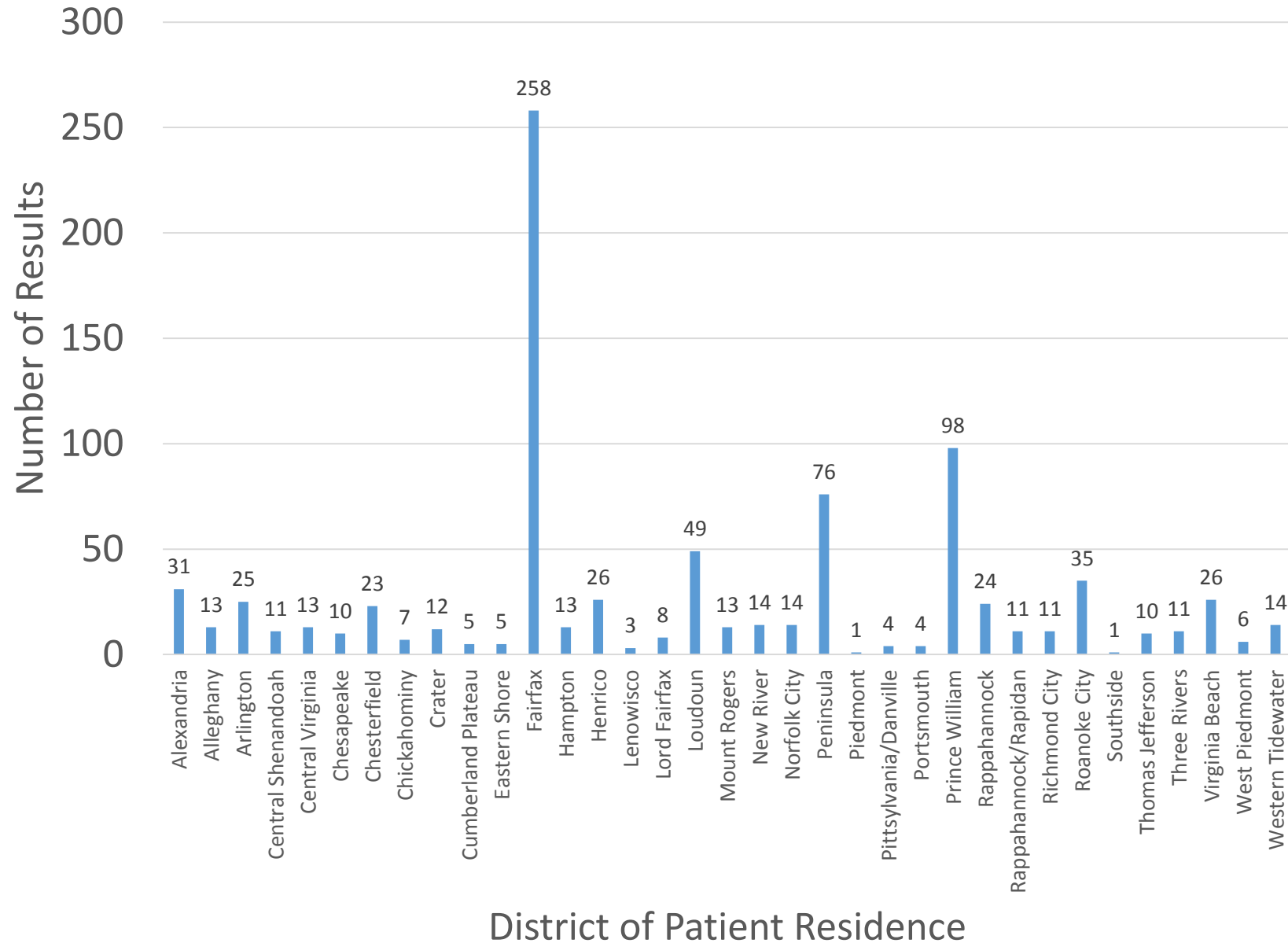
- LabCorp
- Quest Horsham
- Quest Atlanta
- Quest Teterboro
- Quest Tampa
- Riverside Walter Reed
- Riverside Regional Medical Center
- Riverside Tappahannock Hospital
- Riverside Doctors Hospital of Williamsburg
- Riverside Memorial Hospital
- Mary Immaculate Hospital
- St Mary's Hospital
- ARUP Laboratories
- Lewis Gale Medical Center
- Va Medical Center – Salem
- Catawba Hospital
- Smyth Community Hospital
- Russell Medical Center
- DePaul Medical Center

Reports Received

1493 Reports

- 885 Electronic Lab Reports (deduplicated)
- 203 Electronic Epi-1s through the RedCap Portal
- 405 faxed/mailed reports

ELR IGRA Results by District of Residence,
11/11/2018-3/21/2019



Next Steps

- VDH TB Program is working to enter/create investigations in VEDSS for all current LTBI reports
- Provide districts with district level feedback
- Convene LTBI Work Group – thank you to those who have volunteered!
- Review level of reporting (actionable vs. purely surveillance)
- Develop education, tools, recommendations and strategies for moving forward in collaboration with districts and LTBI Work Group
 - Identification of reporting gaps
 - Provider outreach
 - Targeted follow-up

Program Reminder

Please report your
confirmed and presumptive
cases to the VDH TB Program
via RedCap within three days

TB DISEASE

[Reporting](#)[Testing](#)[Treatment/Management](#)[Drug Resistance](#)[Contact Investigation](#)

TB Disease is a **rapidly reportable** condition in Virginia as reflected in the [Virginia Reportable Disease List](#). Providers must report all suspected and confirmed cases of TB Disease **immediately** to their local health department.

- [Tuberculosis Disease and Tuberculosis Infection Reporting Guidance in Virginia](#)

[Click here](#) for contact information for your local health department.

For Local Health Districts:

- Report all new presumptive and confirmed TB cases to VDH TB Program via the [electronic portal](#) within **three days** of learning about the new case.
- Contact a VDH TB nurse consultant as needed and/or if you anticipate media attention during a contact investigation.
- Contact a VDH TB Program consultant if you need assistance with an environmental assessment associated with a contact investigation.

Initial Notification to VDH TB Program of a New Active TB Case/Presumptive

Please submit this information as soon as possible, but within three business days of learning about the case/presumptive in your district.

Thank you!

VDH TB Program

1) Case Last Name

* must provide value

2) Case First Name

* must provide value

3) Date of Birth

* must provide value

4) Street Address

* must provide value

5) City/County

* must provide value

6) State

* must provide value

7) Zipcode

* must provide value

8) Date Case Reported to Local Health Department

* must provide value

9) District

* must provide value

10) Type of Case

* must provide value

11) Site of Disease

* must provide value

- ☐ Pulmonary
- ☐ Pleural
- ☐ Lymphatic: Cervical
- ☐ Lymphatic: Intrathoracic
- ☐ Lymphatic: Axillary
- ☐ Lymphatic: Other
- ☐ Lymphatic: Unknown
- ☐ Laryngeal
- ☐ Bone and/or Joint
- ☐ Genitourinary
- ☐ Meningeal
- ☐ Peritoneal
- ☐ Other
- ☐ Unknown

select all that apply

12) Do you anticipate a contact investigation that could attract media attention (i.e. a school, factory or large office setting)?

* must provide value

- ☐ Yes
- ☐ No

Call a TB nurse consultant to discuss contact investigations that could attract media attention.

13) Nurse Case Manager Name

* must provide value

14) Nurse Case Manager Phone Number

* must provide value

15) Nurse Case Manager E-mail

* must provide value

Submit

Questions?

Contact:

Laura R. Young

laura.r.young@vdh.virginia.gov

804-864-7922



References

World TB Day — March 24, 2019. MMWR Morb Mortal Wkly Rep 2019;68:257.

DOI: <http://dx.doi.org/10.15585/mmwr.mm6811a1>

Global Tuberculosis Report, 2018. World Health Organization.

https://www.who.int/tb/publications/global_report/gtbr2018_main_text_28Feb2019.pdf?ua=1

Amish Talwar, MD, MPH; Clarisse A. Tsang, MPH; Sandy F. Price; Robert H. Pratt; William L. Walker, DVM, PhD; Kristine M. Schmit, MD, MPH; Adam J. Langer, DVM, MPH. Tuberculosis — United States, 2018. Provisional Surveillance Data for World TB Day March 14, 2019.